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DEPARTMENTS

LEA is very much in the picture at JACK & HEINTZ

BURRING and BUFFING
JAWS CONNECTORS GEARS

Recently we were awarded the Army-Navy "E" for work done in the important field of finishing . . . for the production of burring, polishing and buffing compositions . . . for technical help in aiding war contract companies to work out fast, efficient methods.

No better example of this very service can be found than at the Jack & Heintz plant in Cleveland where LEA is very much in the picture. This company had war contracts that called for the best in production methods. LEA Technicians helped them work out efficient finishing operations and then provided the proper grades of compositions. Jack & Heintz is a steady user of LEA Compositions.

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VOL. 42, NO. 9 METAL FINISHING SEPTEMBER, 1944
PREPARATION, ELECTROPLATING, COATING

A Subject of Interest

The application of electrodeposited coatings to non-conductors is undoubtedly the subject most popular today with post-war planners, not only in our own field, but in a number of others, judging from the numerous inquiries we have received during the past year and by the interest exhibited by industry. A tremendous volume of material has been published on this subject but the technical and patent literature has been so widely scattered that the average plater has never been able to take advantage of all the information available to him.

Considering the enormously expanded wartime applications of the process and the probable post-war prospects, it was obvious that organization of the published data would fulfil a long-felt need. We knew that Mr. Samuel Wein, who has been identified with the metallizing of non-conductors for more than twenty-five years, has been collecting such data and he was therefore invited to undertake the correlation of this mass of information for our readers. The first part of Mr. Wein's all-inclusive survey appears on the following pages and will be continued in subsequent issues.

The data for this series have been either abstracted from the original sources or included in their entirety and represent the contributions of government and private laboratories and research organizations, trade associations, catalogs, technical books, technical abstractors, foreign and domestic patent issues, commercial releases and reports from various sources. The author has avoided interpretation of these references and the processes are therefore included as described by the original sources. The subject matter has been organized into groups of processes, and, in view of the extensiveness, the appropriate references will be listed, for convenience, at the end of each group rather than at the end of the whole series.

We believe that this survey is the most comprehensive collection of information on the subject of metallizing non-conductors to appear to date in any language and it is indeed gratifying to have succeeded in obtaining it for the benefit of the readers of METAL FINISHING.

Metallizing Non-Conductors

PART I

By SAMUEL WEIN

New York, N. Y.

Historical Survey

THE deposition of metals on other metals is recorded by the ancient alchemists in their biblical teachings. However, as time went on, newer metals and materials were found, and the need for finishing them in different effects or colors to suit the individual requirements soon presented a new field of search and activity. Particularly so is the case in which metals had to be deposited on insulating materials for new fields or industries, as for instance in the case of *electrotyping*, where a wax impression of type matter is reproduced in metal so that it may be used as a printing medium itself.

The museums of the larger cities have on exhibition examples of metallized wood and terra-cotta made by the Egyptians. This was done only for decorative purposes.

About the earliest recorded method for mold making is accredited to H. Jacobi who, in 1837, deposited metals on wax, and subsequently stripped (separated) them. Then came Thomas Spencer and J. C. Jordan, and along about 1840 Robert Murray applied graphite to non-metallic surfaces to render them electrically conductive, later reproducing engraved copper plates by his so-called "galvanoplastic" method. In 1841, Alexander Jones obtained a patent for *sensitizing* or rendering conductive the surfaces of lace, wood, leather, porcelain, glass, etc., by application of copper. In the same year, Alexander Parks was granted a patent for metallizing animals, insects, flowers and fruits by the application of a silver nitrate solution. The silver nitrate formed a part of many other processes, which varied simply in their methods of application. For example, a patent obtained by Noualheir and Provost in January, 1857, described the metallization of a soft surface such as a human corpse by placing the body in a suitable attitude and spreading pulverized silver nitrate over it with a brush; then electroplating it in a copper sulphate bath, thus producing a copper plated mummy. The following years saw numerous patents for the electrolytic deposition of metal on all types of non-metallic materials.

Division of Subject Matter

The problem of metallizing insulating materials, although not strictly a difficult one, is too diversified, and the literature is too scattered. If the patient worker, experimenter, laboratory technician or plater were to attempt making a bibliography of the subject matter, he would soon be confronted, as was the author, with too much duplication in reading matter, and this tends to confuse rather than enlighten one. Further, a number of investigators in describing their processes or methods have failed to properly correlate the information in a group form, and once again confuse the reader. Also, the material often presented is loose with respect to a given group in a specific method or process group.

It is the purpose of the present text to properly co-ordinate the subject matter in group forms, *i. e.*, a group will be given process and all modifications coming within that group. In that fashion, a better understanding of the specific group or process will be understood.

As may be expected, the number of groups known in the literature are legion, and these may be summed up briefly as follows:

1. In which finely divided graphite is applied to the surface.
2. The admixture of graphite with a suitable binder such as wax, resinous materials (natural and synthetic), rubber, gutta percha, gelatine, etc.
3. The admixture of finely divided metallic powders with suitable binders as in the case of No. 2.
4. The chemical precipitation of metallic films such as silver, copper, gold, lead, nickel, etc.
5. Metallic paints, in which a metal or a compound of the metal is mixed with a reducing essential oil, and applied to a glass, ceramic or similar surface, and fused into that surface at elevated temperature.
6. Spraying molten metal in the form of a mist by compressed air, somewhat in the same fashion as is carried on with lacquer solutions.
7. Evaporation, where the metals are distilled or evaporated in a high vacuum chamber and condensed on the surface to be metallized.
8. Cathode sputtering, where the metal is transferred under the influence of a high voltage and in a high vacuum to the article placed between an anode and a cathode.

Basic Steps Necessary

The deposition of metals on non-conducting surfaces is by no means difficult, and, as a matter of fact it is somewhat identical in many respects to the deposition of metals on metallic surfaces. Herewith is a resume of the steps necessary to the deposition of metals on insulating materials:

1. The object is given a slight roughening treatment, in order that the subsequent metallic films deposited or precipitated thereon will adhere to it tenaciously.

2. The next process is one of degreasing, *i. e.*, the elimination of oil, finger marks, etc.

3. Cleaning. As a matter of fact, the degreasing and cleaning process may be combined in one step.

4. A preliminary or initial electrically conducting coating is applied to the surface of the object.

5. A solid metal surface is built up on the conducting medium by electroplating, generally from an acid copper sulphate bath.

6. The objects after suitable polishing treatment, are plated with the "finishing metal" such as silver, gold, etc.

The essential and most difficult step in the process is step number 4, *i. e.*, getting a preliminary conducting coating on the object. For this step there are a choice of methods that give rise to the various techniques we intend to discuss in detail, and in their respective order with respect to groups of processes.

Let us now consider what are the advantages obtained in the various industries and the uses of films of metals on non-conducting surfaces.

Advantages of Metallizing

Some of the advantages associated with the deposition of metals on non-conducting surfaces are:

1. Electrical Conductivity: Low resistance (good conductivity) is obviously had from such metals as copper, nickel, silver, zinc, etc., which can be plated in any thickness required. By proper masking, conducting channels can be plated into the part without making the entire part a conductor.

2. Decreased Moisture Absorption: Absorption of moisture from the air, free water, oils and solvents is naturally decreased by the continuous metal film applied. This is particularly valuable in the case of machined parts where the machining operation increases the absorption factor.

3. Increased Heat Resistance: The metal coating facilitates heat dissipation, and permits the use of plastics at higher temperatures. Heat resistance is raised as high as 40° F. Resistance to low temperatures is likewise increased, and permits the use of such materials as cellulose acetate for certain applications where it is unsuited without plating because of its brittleness at sub-zero temperatures.

4. Corrision Resistance: Unlike the plating of dissimilar metals, where electrolytic action takes place causing attack, the plastic basic surface, being inert, supports longer life of the plating and in fact of the whole unit. Resistance to salt water is excellent.

5. Dimensional Stability: Dimensional changes in such materials as cellulose acetate are greatly decreased by the additon of a moderate metal plate, making these materials suitable for applications which this unfavorable feature previously prohibited.

6. Impact and Abrasions: All plastics are considerably improved in this respect, which suggests the use of plated plastics for mechanical parts such as gears, bearings, valve parts, etc. The strength of threaded parts is greatly improved.

7. Weatherability: The metal surface imparts weather resistance to a plastic fitting, making it suitable for exposure to extreme weather conditions.

8. Flexibility and Rigidity: These factors can be varied at will by proper selection of the metals plated and thickness of the plated surface. Marked stiffening or strengthening qualities can be added where that is desirable. On the other hand, such flexible materials as Saran can be plated with the softer metals and maintain much of its flexibility. The plating of films and plastic insulated wires can also be performed.

9. Solderability: Soldering of connections is entirely practicable.

10. Weight: In most cases, the weight added by the plastic plating is negligible and plated plastic parts still maintain the weight advantage they enjoy over metal pieces.

11. Cost: While the plastic plating process is somewhat more costly than ordinary plating on metal in many instances, the final cost of the plated plastic piece is often less than its metal counterpart.

12. Color Effects: If it is desired, two or more metals together with the color of the insulating medium, will give different color effects not possible with plating on metals, enhancing the sales appeal of the item under consideration.

Applications

It is fitting to review here some of the uses to which industrial deposition of metals on various non-conducting surfaces have been applied, this will give one an idea of the seriousness with which the subject matter is now being considered.

Electrical Industries: The electrical industry has, during the past decade or so, found an increasing number of uses for metallized materials, as an illustration, here are a few of the more common applications:

Platinum films are used on glass tubing, etc., for high vacuum equipment, to seal metal to glass for contact and other technical purposes. In the former case, other metals may be soldered to the platinized surface. The bond is so strong that, provided the metal wire or lead is light, and the non-metal body sturdy enough, it is almost impossible to tear the two apart, without chipping the glass. Silver paints may, of course, be used for the same purpose.

Silver films on glass or mica are being used to a great extent for manufacturing condensers used in radio.

Fuse and high tension contacts for X-ray equipment and lightning arrestors.

Grounding sleeves for photo-cells, and the grids in selenium types of light-sensitive cells.

Piezo electric crystals are coated with various metals to insure intimate contact between the elements.

Shielding for high frequency oscillators and for electromagnetic circuits as well, including so-called "Faraday cages," antenna, cabinets, coils, etc.

Electrical contacts on both ends of a resistor unit, in which the high resistance material is deposited between these contacts.

Contactors for switches, motor controls, etc.

Hazelton holds together two parallel flat glass plates spaced a short distance apart, and secured together along their marginal portions by a metal paint. The invention is particularly adapted for use in windows, windshields, partitions, etc., making a hermetical seal.

Mirrors: Backing up silvered glass types of mirrors, in the place of asphalt and lacquer films, using electrodeposited copper. Heliograph mirrors.

The specifications as outlined by the War Department demand the silver mirrors be copper plated.

Parabolic Reflectors: Electroformed reflectors are used in the motion picture projectors (theatres), and these are made by first having an accurate mold made in glass, precipitating a silver mirror on its surface, subsequently depositing a sufficient thickness in copper. The reflector so formed is now released from the glass mold by immersing in hot water, then in cold, changing from one to the other, several times, and the contraction and expansion between the two is such that the electroformed mold will slip off with ease and without resorting to the use of sharp instruments to pry it off. The silver surface is then plated with rhodium and highly polished to serve as the reflecting surface. The rhodium will not tarnish like silver.

Tinsel: Transparent sheets are coated on one or both sides with silver and gold to form tinsel used in fancy packaging.

Fink and Beers distilled magnesium on the inside of Thermos and similar evacuated bulbs as the reflecting medium.

Plaster Castings: Plaster of Paris, stone, marble and composition statues for decorative purposes.

Cork: Cork is plated to make it water-proof and to give it rigidity.

Chemical Uses: Catalysts as non-metallic carriers in silica gel, pumice, asbestos, silicon carbide, glass wool, porcelain beads, refractory oxides. Chemical equipment and thermometer bulbs are reinforced.

Leather: Molds for reproduction of alligator and other grained leathers, and inlaid effects in linoleum, etc. Baby shoes are plated with brass, silver and gold for sentimental reasons.

Aeroplane Propellers: Aeroplane propellers are plated with copper or other metals to provide greater rigidity and to reduce surface resistance (air), according to Merritt and Gwaltney.

Stencil: Stencils for printing and decorative purposes for metals, cloth, etc., are recommended by Sherman.

Danilevsky and Tourchaninoff showed equipment for depositing copper, etc., on graphited fabrics.

Records: Phonograph master records, made in wax (insoluble soaps) or in a plastic material such as cellulose acetate affixed to a rigid base, are plated with a suitable metal and then backed up to a desired thickness for production of "stampers" to make duplicates in resinous materials, according to Dimon.

Molds: For molding plastics, rubber, compositions, etc.

Animal Tissues: Bugs, birds and bird legs have been plated for ladies' hat pins, umbrella handles, etc.

Vegetable Materials: Fabrics, textiles, cotton, wool, silk, paper, wood, linen, jute, hemp, leather, paper pulp, gelatine, mica, etc., have been plated with various metals for industrial, technical and decorative purposes. Amongst the synthetic threads plated are viscose, acetate, rayons, etc.

Flowers and Fruits: Flowers and fruits for jewelry and decorative purposes.

Industrial: Cams, handles, instruments, machine parts, rollers, boxes, dental plates and models, hardware, musical instruments.

Electroforming and Electrotyping: This is the largest application in the deposition of metals on insulating materials (in this case copper on wax). The industry is about 100 years old, and, in this country, approximately 300 electrotype foundries duplicate printing plates valued at nearly $30,000,000 annually, according to the National Bureau of Standards, and Winkler.

Glass Decoration: Here the methods are substantially the same as in the pottery business, and the same precious metal preparations, with certain modifications are used. Flatware, vases, drinking and ornamental glasses of every description, cocktail sets, coffee brewers of Pyrex or resistant glass, are prominent among the great variety of objects to be decorated. Some of the larger glass houses, which turn out enormous quantities of machine blown tumblers, are using skillfully devised banding machines which automatically apply bands and lines of gold and platinum to the tumblers without any other manual labor than one operator who feeds the tumblers to and removes them from the machine. Tumblers are particularly suitable for this method of decoration on account of their simple, in the main cylindrical shape. Glass buttons, bangles and dress appurtenances are other uses. Finally glass letters for signs in show windows may be mentioned, which are coated with gold on the inside and, therefore, form an effective advertisement in brilliant gold which is at the same time resistant against mechanical abrasion or atmospheric influences.

Enamelled Ware: Here manufacturers use precious metal decoration to a smaller extent than the pottery and glass industries. Nevertheless, the field of application is constantly widening. Some firms deposit the precious metals on enamelled letters which in turn are used on large signs. Others decorate bowls, dishes, cups, etc., with gold or platinum in the form of bands and lines. Gold and platinum are used by some manufacturers for affixing their names and trade marks permanently to their products, such as refrigerators, ranges, etc.

Earthenware and China: Here dinnerware, art ware, bric-a-brac, etc., are banded and other geometric designs are applied in silver, gold and platinum. Dishes, knobs, handles, etc., are free-hand painted and so are, naturally, large surfaces and all-over decorations. Pottery looking like solid gold or platinum is usually a fine film of these metals on the surface of the glaze of earthenware or china. More intricate designs may be applied by means of rubber stamps directly to the ware, or printed from steel or copper plates on very thin printing paper and then transferred to the objects to be decorated. Again, the designs may be applied by means of silk screen stencils.

Tile: Scenic effects in plaques set in and around fire places and tables or wall plaques are made by depositing silver, gold and platinum. Bath room fixtures are also decorated with silvered geometric designs.

Terra Cotta: This has about the same applications as are used by tile manufacturers. However, more exterior work is done with terra-cotta. It is interesting to record here that the Federal Court House Tower in New York City can be seen for miles around and when the light of the late afternoon sun sets it ablaze, it appears to be a flaming torch. Others are the Richfield Building in Los Angeles, Calif.; the Public Library in Philadelphia, Pa., and the Philadelphia Mu-

eum in Philadelphia, Pa., and the Department of Justice, in Washington, D. C.; including several United States Post Office Buildings in various localities. A lot of statuary work as well as gold letters for signs made in terra-cotta are decorated with silver, gold, and platinum.

Miscellaneous: A casual survey of the neighborhood stores will reveal various types of novelties made of all sorts of insulating materials, cast and molded by the various processes, and, in the form of ash trays, bag frames, bracelets, buttons, cigarette cases, cigarette lighters, costume jewelry, fountain pen barrels, jar tops, pencil sets, poker chips, beads, razors, bottle closures, etc.

Now that we have discussed the generalities and the necessary steps required in the treatment of surfaces to deposit metals thereon, we shall discuss the first of the series of methods commonly known, *i. e.*, those known as "mechanical films."

Mechanical Films

The metallization of insulating materials through the agency of specially produced metal powders suspended in a suitable "bonding medium" such as varnish or lacquer follows the orthodox technique of enamelling or finishing departments of the various industries. In the metal finishing field, such finishes are primarily decorative, in the case of plastics or other insulating materials the conducting properties of the metals held in suspension in the varnish or lacquer film is sought for.

The term "mechanical film" is used here because the conducting medium, in the form of a fine powder, is held mechanically to the given surface, and is not chemically deposited on that surface.

In order to facilitate the adhesion of the mechanical films to be described, experience has taught us that if the surface is slightly roughened, the films applied thereto will adhere much better. This adhesion is favored because of the minute grain on the surface exposed to the bonding medium. There are several methods for roughening the surfaces of the materials to be treated with the bonding medium, each method requiring a different processing.

Porous Materials. Hogaboom and Hall sum up the necessary requirements for plating porous materials in the following manner: "There are three distinct steps involved in the preparation of non-conductive objects for plating, and these are (1) the article is waterproofed if necessary; (2) a so-called 'bond' for the conducting medium is applied, and (3) a medium to conduct the electrical current over the entire surface is applied thereto. In many cases, one or two of these steps may be combined or eliminated."

In preparing insulating materials for metallizing, it is best to divide them into two classes: first, those items that are very porous such as plaster of Paris, wood, papier mache and similar materials; second, those items that are less porous, such as leather, fruits, flowers, etc.

The first operation in preparing the surface of the very porous item is to make it water- and acid-proof. Unless this is done, the solutions used in the subsequent processing will penetrate the article and spoil the entire operation. To make the article water- and acid-proof, it is usually placed in a wax or wax-like compound, thereafter shellaced or treated with resinous materials, asphalt, gutta-percha, etc., etc. Wax is usually used only where good adhesion of the deposit is not necessary such as in the case of models for molds where the deposit is detached afterwards, or for articles such as plaster of Paris which although porous, have enough stiffness to prevent deformation which might cause the deposit to lift off. In the latter case, shellac and lacquer are used to better advantage. Wax has one disadvantage —it has a tendency to "lift" when hot weather sets in.

Roughening the Surface

Mechanical Roughening. The term "mechanical roughening" refers to sand blasting, sand rolling or pumicing. In any case, too much roughening is to be avoided, as it will give rise to that undesired rough plating effect known as "orange peel."

In the case of glass, it may be either sand blasted or better still it can be etched with a dilute solution of hydrofluoric acid.

Chemical Roughening. Several chemical roughening methods have been proposed and patented for use with plastics. The essential point is that they assert a dissolving action on the plastic of which the article is made. The common plastics that are encountered are phenol-formaldehyde, cellulose ester and urea-formaldehyde series.

As we see, these resins are made up of different compounds and subsequent treatment, hence, each requires a different or specific chemical pre-treatment for chemically roughening or etching same.

For cellulose esters, as an illustration, an acetone solution may be used either alone or in conjunction with other solvents.

Occasionally, if care is used, an ordinary "acid bright dip" will also be found to give good results, again, strong caustic soda solutions are sometimes utilized for the same purpose. A few experiments will soon prove which of the methods is particularly suited to the individual case.

The phenol-formaldehyde plastics according to Ow-Eschingen is immersed in a compound made up of:

Hydroquinone	4 parts
Pyrocatechin	1 part
Acetone	100 parts

for 3 to 5 minutes.

In the case of urea types of plastics, a 4 to 5 percent solution of hydroquinone heated to about 90° C. for about 2 minutes is employed.

Loiseleur treats cellulose acetate with a solution of

Quinone	15 grams
Water	100 grams

and subsequently washes it with running water and the work is dried.

In the case of glass and ceramic materials, the surface may be etched with dilute solutions of hydrofluoric acid.

Degreasing. It is necessary that superficial grease be removed from the surface of the materials about to be treated, using such solvents as carbon tetrachloride or trichlorethylene, after which it is air dried, and set aside where no dust can collect on it, as otherwise this material will have to be recleaned. Calgonite and Nacconal NR have been used with good results.

Cleaning. Use a 2 percent potassium hydroxide solution, or some good commercial platers' solution recommended for cleaning purposes. Be sure that temperature of the solution is not over 110° F. otherwise the plastic will be deformed, particularly so

if the material belongs to the thermoplastic group. It is preferable that this cleaning be done at room temperature. The work is now well rinsed in running water. Some workers prefer to use a warm solution of chromic acid followed by a thorough rinse in hot water. In the case of materials such as glass, etc., higher temperatures may be used in cleaning.

The work may be cleaned by dipping in a mild alkaline cleaner followed by a thorough rinse, a nitric acid dip and another thorough dip.

Conducting Materials

Types of Conducting Materials. At the present time two types of materials are used, the conductivities of which are known to be comparatively high, these are (1) the metallic powders and (2) graphite.

The Metal Powders. Those metal powders which are employed for plating purposes are available in several grades of fineness, the metals commonly used are copper, brass and bronze, although other metals such as aluminum, etc., are likewise obtainable. This latter metal has a high electrical resistance (relatively poor conductivity), introducing new plating difficulties, and we will, therefore, not discuss or consider it here. Not only are these metallic powders available in various degrees of fineness, but also in a few ranges of metallic brightness (sheen).

If the metallic powder is greasy, it should be washed with a suitable thinner before using. McNulty treats the metallic powder with carbon disulphide in order to degrease it.

Once the metallic powder has been degreased, it should be stored so that no grit, dust or other foreign matter will collect with it, as otherwise the degreasing and cleaning process may be required again.

Graphite like the metallic powders is to be had in different grades of fineness. The point to remember in using this material is that it be free from grit or coarse particles and grease.

Graphite is used principally for coating wax because of its affinity for greasy or waxy surfaces. The simplest way to apply graphite is by means of a soft camel's hair brush and to continue this until the surface has a fine gloss or polish. This is known as the "dry process." Graphite may likewise be applied wet, as the following suspension, for example:

Graphite	2 lbs.
Water	1 gal.

This combination is sprayed onto the wax surface and the graphite adheres to the wax surface.

A prepared graphite is available from Acheson Colloids Corp. in Port Huron, Mich., termed "Dag graphite SR-2." Here the object is first washed to form a clean surface, and, after drying, the object is coated with the graphite compound in the consistency in which it is supplied by the producer, allowed to air dry over night and plated in an acid copper bath.

Hogaboom and Hall suggest the following wax molding compound:

Beeswax	85%
Turpentine	10%
Graphite	5%

A Los Angeles, Calif, plater specializing in plating baby shoes uses the following procedure. The dry shoes are first treated with a weak solution of potassium dichromate, subsequently treated with Aquadag, and allowed to air dry. The surface is now buffed lightly and plated from an acid copper plating bath.

"Aquadag type XX" is applied to the cleaned surface and baked for either a period of one hour at 260-280° F. or for four hours at 150° F. The piece so treated is then copper plated in an acid copper plating solution.

Harrison adds metallic salts to the graphite in order to increase its electrical conductivity, here are two such formulations he recommends:

Solution No. 1

Graphite	1½ lbs.
Water	1 gal.
Bronze powder	½ oz.
"Kainit"	½ oz.

Solution No. 2

Graphite	1 lb.
Water	1 gal.
Metal salt	½ lb.

The metal salt in this latter case may be a chloride, nitrate or sulphate of let us say copper, iron, silver, etc. Schor recommends the following:

Graphite	10 ozs.
Silver nitrate	1 oz.
Water	1 pt.

The ingredients are well mixed and heated in a porcelain dish over a water bath until dry. The mixture is now placed in a crucible and heated to a red heat. It is allowed to cool, ground in a mortar and passed through a fine sieve (about 200 mesh) and sifted onto the wax mold, and brushed till a high polish is had. It is now ready for plating.

Mindeleff uses iron and zinc powder, 1 pound each with ½ pound of graphite.

Bonding mediums for providing adhesion and continuity of the conducting material and miscellaneous preparations will be discussed in the next installment, which will appear in an early issue.

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Continuous Straight Line Operation

At Texas Division of North American Aviation

By GERALD ELDRIDGE STEDMAN

THOSE many "active acres" of the Texas Division's plant A and B at Dallas is the locale where North American Aviation, Inc. fabricates "that wild horse of the air", the P-51 Mustang . . . high-flying, fastest fighting pursuit plane in the world. In these same plants are built the Texan combat trainer, also N.A.A.-designed, as well as the B-24 Liberator; N.A.A. being one of three companies participating with Consolidated-Vultee in that activity. These many acres are certainly a wonderland of aviation achievement in production per manhour and in square feet of area.

The constant N.A.A. aim is to eliminate, combine, improve the sequence or simplify the flow of fabrication. No piece, part or any of the vast number of sub-sub-assemblies fails to come under critical analysis. This has had to be because nowhere else are three military aircraft, so basically different, produced under one roof . . . and here, too, N.A.A. produces 97 per cent of all parts in-plant, exclusive of government-furnished equipment and forgings.

The metal finishing operations involved are of complex nature, involving cleaning and plating of numberless parts of all sizes, contours, dimensions and of varying metals. The cleaning of aircraft parts and surfaces here involves aluminum and many of its alloys, iron and steel (including stainless), copper, brass and bronze, magnesium alloys, even glass and transparent plastics. Protective treatment involves cadmium, zinc, anodizing, phosphating and coating of magnesium alloys. Chromium plating is required on many hydraulic parts and in tool repair.

Naturally, such an immense cleaning and plating requirement has been reduced to the straight-line operation flow. It is the purpose of this article to describe some of the equipment and technique involved, this visit being the author's 224th plant observation since Pearl Harbor.

A leading feature of N.A.A. cleaning equipment is the mammoth, continuous automatic alkaline cleaner, whose overall dimensions are 7'6" wide x 11'6" high x 75' long. It has four 13' compartments and one 9' drying oven. There are four 350 g.p.m. and 50 ft. head pumps which serve four sets of spray nozzles in 5' long banks consisting of 66 five g.p.m. nozzles.

The cleaner is motivated by a variable speed conveyor, moving six to 15 f.p.m. All tank heating is by steam coils. Final hot air dry is in a gas fired oven. The conveyor is equipped with a series of vertical plates, joined by a link fastening system. Small work is carried in baskets spaced about 4", the belt riding on a chain track and driven by a variable speed motor. Certain of the design features were designed and specified by N.A.A. engineers. A unique feature is that the cleaner can handle parts of any length, such as 20' or 40' stringers. Feeding is arranged so as not to permit channeling drain that would cause runback of the solution into wrong tanks. This is accomplished by an air curtain on each side of the chromic acid dip, set to blow the solution down into its own tank.

This large equipment is in "B" plant to accommodate the B-24 work. In "A" plant, where the Mustang and Texan trainer are produced, equipment consists of a series of 23' long x 5' deep x 3' wide tanks. The work is fed by overhead crane into them in baskets; one being 10' x 4' x 2½", and the other of same dimensions except that it is 18' long. The cleaning process is similar in both plants, only the last step being different, in that in "A" plant, work is dried in air and in "B" plant it is baked by oven which is integral with the cleaner conveyor feed.

The cleaning process is a sequence of five steps:

(1) An alkaline cleaner at 180° F. using metasilicate 4 oz./gal. in still tank, or 1 oz./gal. in mechanical spray with a relative time of 6 to 8 minutes for the first, and ½ min. for the second technique.

(2) Hot rinse at 180° F.

(3) Chromic acid passivating rinse, ½% at 160° F.

(4) A second rinse at 175° F.

(5) Hot air dry using 4000 c.f.m. at 250°-350° F. in the automatic cleaner.

A portion of the small parts in the "dried in air" technique of "A" plant are monorailed to station for chromodizing dip. The remainder of the work is rushed to the paint shop as fast as possible.

Another interesting cleaning apparatus is the combination dip and vapor degreaser. The alkaline bath is usually used with special processes and solvent vapor degreasing in much standard work, in that it evaporates more quickly and dries faster. This N.A.A. degreaser consists of three interrelated compartments of (1) the concentrator, (2) dip and slush, (c) storage.

The degreasing material employed is trichlorethylene with electric immersion heaters for vaporization purposes. The vapor is introduced into the dip and slush area where it is cooled by water jacket, condensing both on the work and the sides. Dripping either into a channel which returns to storage or into the bottom immersion dip, it really completes its concentration cycle by overflow. Baskets on a monorail feed this degreaser, the work being lowered into the dip and slush compartment's bottom solution and then pulled out to rest in the vapor area, there to be further bathed and perhaps again immersed until clean. As the bottom liquid increases in volume, it overflows into the concentrator for revaporization. Storage tank valves open

Figure 1

Figure 2

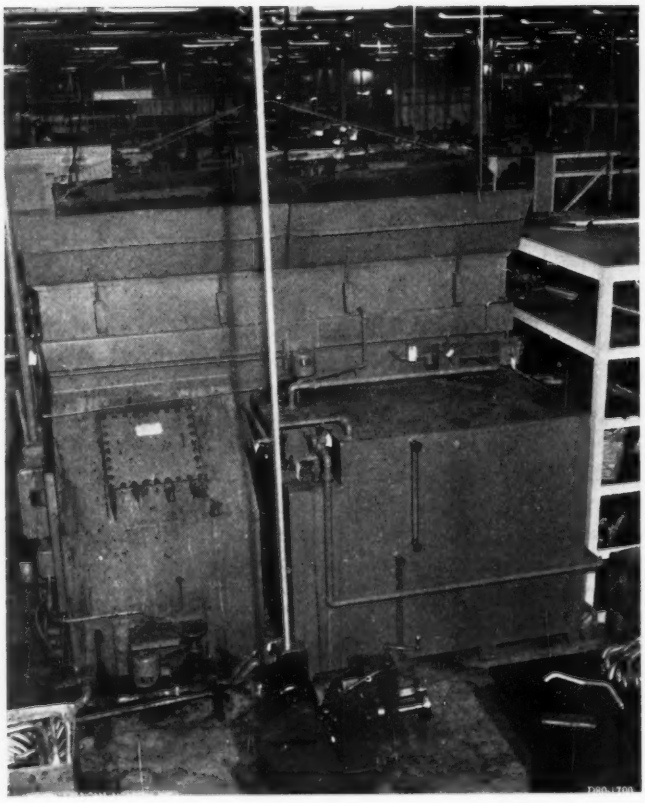

Figure 3

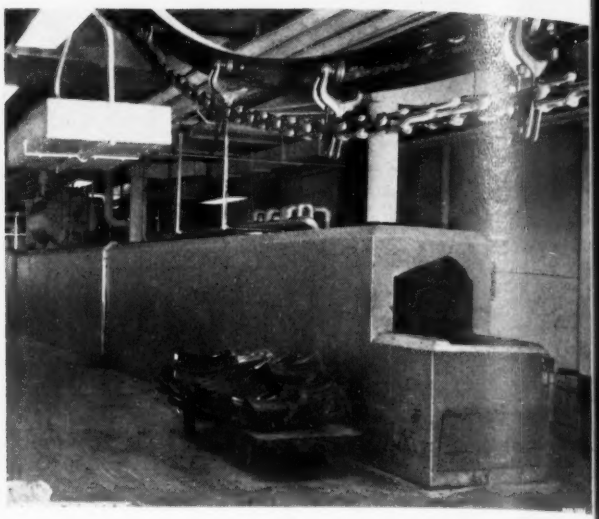

Figure 4

Fig. 1. Gertrude English, a technician in the research laboratory, is shown running a process control analysis to check materials used in processing in the plants.

Fig. 2. This is a general view of the work outside the inclosure of the automatic zinc plating machine showing parts being prepared for plating.

Fig. 3. View from the rear of trichlorethylene degreaser showing a basket of tubing being lowered into the degreasing chamber.

Fig. 4. The tunnel type, automatic, spray cleaning machine used in the aluminum processing department. Overall dimensions of this equipment are 7'6" wide x 11'6" high x 75' long. It has four compartments and one 9' drying oven. The cleaner is motivated by a variable speed conveyor, moving six to 15 feet per minute. All tank heat is by steam coils while final hot air dry is in a gas fired oven, the heater unit of which can be seen near the rear of the cleaner. The cleaner can handle parts of almost any length, such as 40-foot stringers.

Fig. 5. Tubing entering the vapor phase of the trichlorethylene degreaser.

Figure 5

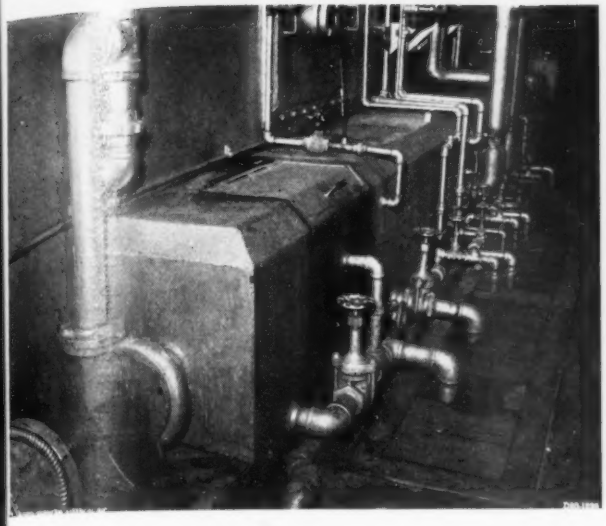

Figure 6

Fig. 6. A side of the automatic cleaner is shown here revealing the storage chamber for the alkaline cleaning solution as well as the motor and pump for the delivery of the cleaning solution to the spray jets inside the tunnel.

Fig. 7. Employee loads parts to be plated on the racks of the automatic zinc plating machine. The racks come back to the same point for unloading after plating. Note the rack in the background being lifted automatically to place parts in the electrolytic alkaline cleaning tank.

Fig. 8. Baskets being filled with work prior to placing in conveyorized washing machine at extreme left.

Fig. 9. Basket of cleaned parts is shown emerging from the automatic cleaning machine.

Fig. 10. The arrangement of the automatic zinc plating machine. The plating tank is in the foreground. Parts to be plated move successively from the loading point (left rear) through an alkaline electrolytic cleaning tank (middle rear), to a hot water rinse tank, an acid pickle, two cold water rinse tanks, the plating tank (foreground), a cold rinse tank, a tank for application of a treatment to increase the corrosion resistance of the plate and a final water rinse to return back for unloading at the point of loading.

Figure 7

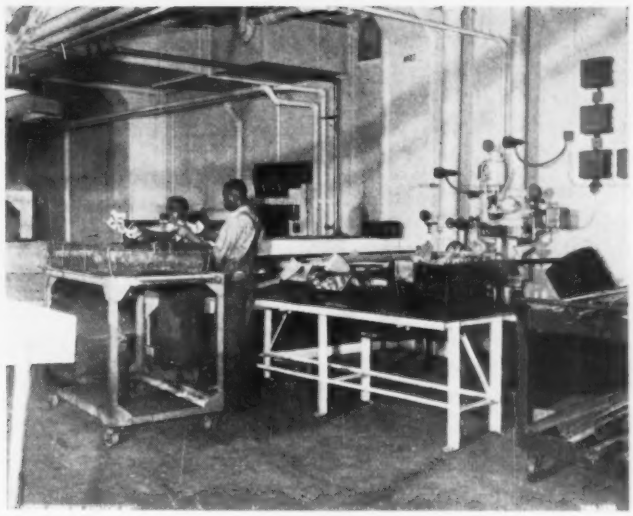

Figure 8

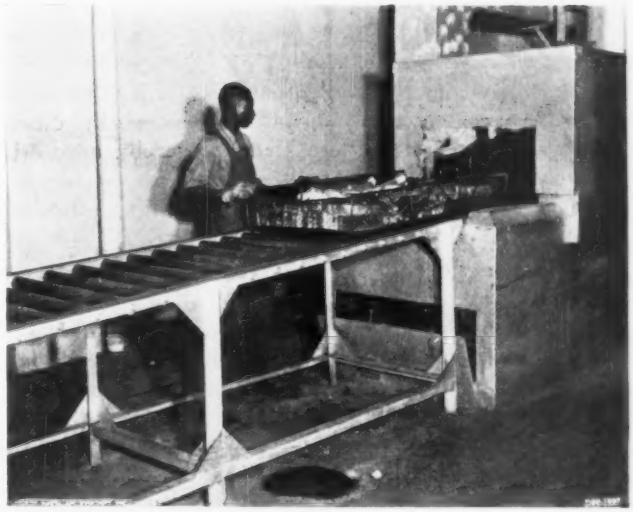

Figure 9

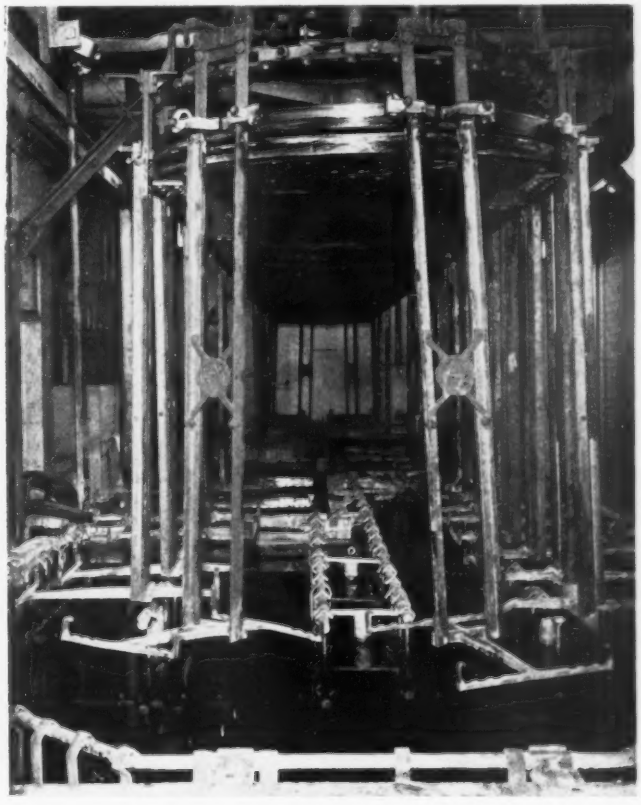

Figure 10

into the slush area to give it bottom immersion charge. A slush pump is part of the equipment, used for very dirty tubing, to flush-spray over tubes in the vapor phase of their treatment, and it is likewise continuously employed to clean the inside of tubing.

Carbon tetrachloride is employed in hand cleaning of parts in zones adjacent to fire hazards. Since the fumes are toxic, such treatment is always very well vented. The cost of this treatment is over nine times that of kerosene, Stoddard solvent or diluent naphtha, which N. A. A. uses in that order of preference for hand cleaning of painted and unpainted surfaces, wherever possible.

Preliminary cleaning for plating operations consists of degreasing as mentioned and descaling by immersion in inhibited acid descaler, or as an alternate, sandblasting is used. This is done only upon specific approval of the research and process laboratories. Usually No. 40 or No. 60 steel grit is employed and silica sand requires specific approval. Air pressure is 60-100 p.s.i. Both hand and barrel blasting is employed; the latter being avoided in work involving thin sections, threads or projections.

Plexiglas, Lucite, Plastacele, Lumarith and other transparent plastics and safety glass are cleaned by diluent naphtha or a general purpose glass cleaner by hand with a wet cellulose tissue, and polished with dry wiping that is neither hard nor fast to avoid setting up electrostatic charges.

N.A.A. plating operations are largely as a protective coating to provide corrosion resistance. The surface condition preliminary to plating must be thoroughly clean, and in the case of copper alloys to be plated in the automatic plating machine, they must also be acid dipped before beginning the plating cycle.

A full automatic plating machine with a return-type conveyor which loads and unloads at the same station is used, adapted to Texas Division operations by N.A.A. engineers. This setup is 41'10¼" long, 9'8" wide, chain speed of 14" per min., height of lift, 40", center to center of carriers 16", and the total number of carriers used is 36. The overall height is 12'9⅛". This provides a systematic flow of work and requires only the necessary number of operators to rack the parts and hang them on the conveyor carriers at the loading station, and to remove them at the end of the cycle. Less labor is required than for equivalent still tank equipment. Limit switches and time relay are hooked up to a magnetic switch to establish proper dwell, transfer and movement of the work through treatment tanks. The supporting steel track and carrier guide rail with cathode bar attached, integrated to a vertical drive and reduction gears with a slack chain take-up together with transfer units at all tank intersections driven from main shaft at their proper speeds, make a well designed conveying system. Work carriers spaced at 16" intervals on the conveying chain establish electrical connection by drum finger contacts on the cathode rail. Steel transfer arms on a ball bearing equipped guide following predetermined paths pick up the succession of work carriers and carry them through the transfer operation. The complete operating mechanism is supported on an overhead structural framework.

The principal plating procedure moves forward in this sequence of steps:

(1) A cleaning operation using an electrolytic alkaline cleaner, 8 oz./gal. at 185° F. for an immersion time of ½-2 min., the work hanging on cathode bar or hanger, using a current density of 50 amps./sq. ft.

(2) A rinsing operation in running hot water at 185° F. for 30 sec.

(3) An acid dipping operation for copper alloys in a solution consisting of 45% sulfuric acid, 7% nitric acid and 0.5% hydrochloric acid, all by volume at room temperature for 15-30 secs. until bright, and can be subsequently pickled in the steel pickling solution if the automatic plater is used. This is hydrochloric acid—50% by vol. at room temperature, for 30 secs. until free from rust or scale.

(4) A rinse in running water at room temperature for 30 secs.

(5) A plating operation (solution: sodium cyanide—5 oz./gal., zinc cyanide—8 oz./gal., caustic soda 12 oz./gal., zinc addition agent 0.8 oz./gal.) at room temperature until desired plate thickness obtained. Sodium carbonate is not added as a constituent of the bath, but concentration should be kept below 10 oz./gal.

(6) A rinse in running water at 185° F., for 30 secs., using a different tank than for the rinses foregoing.

(7) A chromic acid dip using chromic acid 3-5% by wt. at room temperature for ½-2 min.

(8) A rinse in hot water at 185° F. for ½-2 min.

(9) Air drying, using gloves to unload and handle.

(10) In the automatic plating machine only, a baking operation for hydrogen embrittlement relief at 375° F. ±25° F. for three hours. Large parts may be steel wooled lightly to prevent yellowing of the plates.

(11) Steel parts which have unplated areas are given a linseed oil treatment at room temperature, as a corrosion preventive for the unplated areas.

(12) Parts requiring removal of plate are submitted to a stripping operation in a solution of ammonium nitrate 10.3 oz./gal., and nitric acid 5.5% by vol. at room temperature and until plate is removed.

(13) Stripped parts are rinsed in tap water at room temperature for 30 secs.

Concentrations given are for original makeup. Immersion times given are for hand operations as the times and movements are fixed by the action of the automatic plating machines when it is used.

The plating thickness is held to a minimum of 0.0002" on articles having integral parts which are threaded externally and on parts whose tolerances will not permit the standard of 0.0005" plate. Zinc coating is applied directly on the basis metal with no preliminary or flash coating of other metals, without undercutting threads and after all welding and brazing has been completed. The purity of the zinc plating solution is of very great importance. Cadmium and chromium solutions must not be introduced into the zinc plating bath. In still tank operation, care is taken not to hang wet parts above the copper electrode bars, since copper would be dissolved and contaminate the solution. Parts, racks and wires dropped into the tank are promptly removed.

These are highspots of the N.A.A. Texas Division cleaning and plating techniques, using the most modern equipment. Attending photographs bring out many of the technical details.

Semi-Continuous Pickling of Strip

By C. F. BUENTE

Sales Engineer, United Engineering and Foundry Co., Pittsburgh, Pa.

THE latest design of simplified low cost semi-continuous strip pickler* was placed in operation at the plant of the Bopp Steel Corporation, Detroit, Michigan, recently.

The Bopp Steel Corporation is engaged in the production of cold rolled strip steel from purchased hot rolled bands in a wide variety of widths and gauges, which are carried in stock up to 22" wide.

Until recently, tub pickling of the coils was practiced, but war-time demands for more and more tonnage made it apparent that some more efficient method was necessary other than an increase in the size of the pickle building and additional pickling tubs.

Investigation of the various methods disclosed that the semi-continuous pickler answered all of the requirements of this plant, for the widths and gauges of the hot rolled strip are such that the strip can be pushed through the various tanks and sprays without welding into a continuous band.

The name "semi-continuous" is derived from the fact that the outer or front end of each coil of strip is pushed through the first tank by the leveller unit from the coil box. At the opposite end of the first tank the strip is picked up by rubber covered pinch rolls, which in turn feed the strip through the second tank and so on through the several tanks to the drier and recoiler.

This arrangement eliminates the welder or stitcher, looping pits and shear usually required for a continuous type pickler. The elimination of these units not only reduces the space required, but is reflected in the lower installation cost of the line and in the total operating and maintenance costs.

In the Bopp line, raw coils are placed by the overhead crane on a gently sloping ramp (Fig. 1). Here the tie wires are cut, corners clipped and the coil made ready to roll onto the coil box without delay immediately after the tail end of the preceding coil has left the coil box.

The front end of the new coil is fed by hand into a set of wide opening pinch rolls, which in turn when closed feed the strip into a leveller unit. The leveller removes the coil curvature and at the same time tends to break up the scale before the strip enters the first tank (Fig. 2). This first tank contains a bath of hot water which wets the strip, removes the fine particles of broken scale and raises the strip temperature. The efficiency of this hot water tank has been definitely proven, for the strip entering the acid bath of the second tank is approximately 180° to 190° F.

*U. S. *Patent No.* 1,837,139.

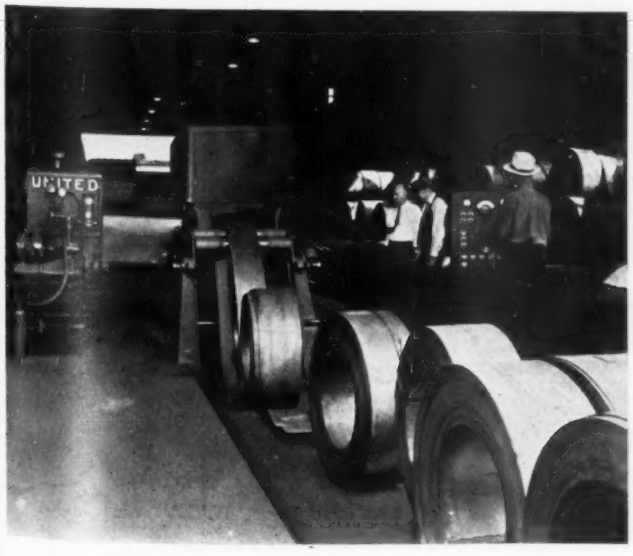

Fig. 1. Raw coils on ramp, ready to roll onto the coil box.

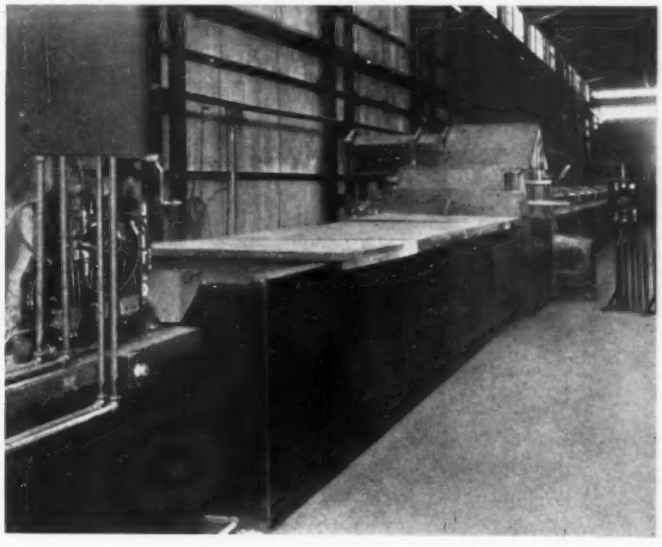

Fig. 2. Hot water tank used to raise the temperature of the strip before it enters the pickling tank.

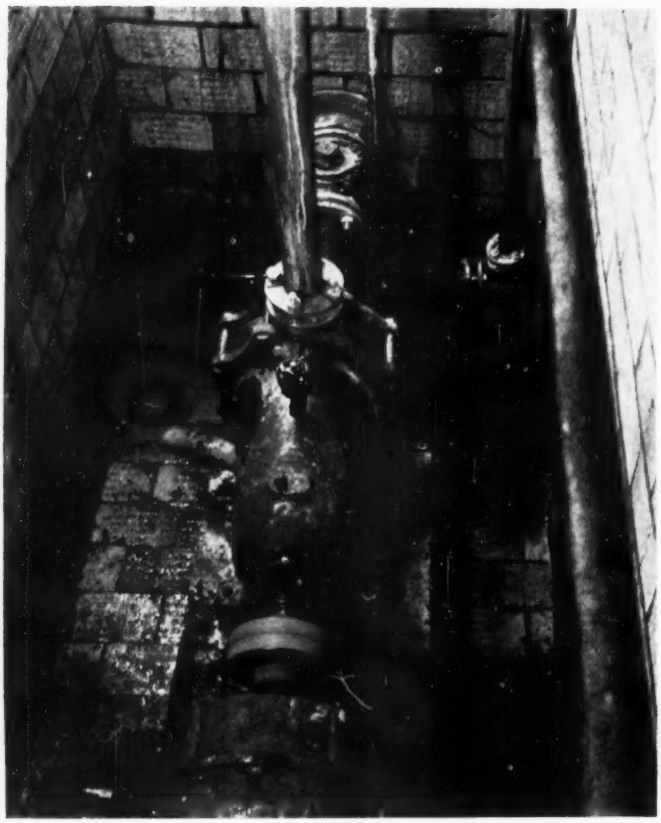

Fig. 3. Sump and pump chamber. Chambers are extensions of pickling tanks.

and as such the pickling action starts immediately in the second tank.

A cold strip entering the acid bath will not start to pickle until it has absorbed enough heat from the acid bath to bring it up to the acid temperature. Therefore, this hot water tank is practically as efficient as an equivalent length of acid tank with a lower maintenance cost.

To help this hot water tank remove the particles of scale, a recirculating spray is used at the delivery end and the volume of fine scale accumulated is remarkable.

This hot water tank, as well as all other tanks, are made of reinforced concrete. The concrete acid tanks are lined with a double thickness of acid-proof tile laid up in a suitable acid-resisting bonding material. The concrete shell is further protected by a 3/8" triple layer of acid-resisting plastic.

The acid tanks are made in two compartments. The top compartment is shallow and is constructed as a trough. The larger chamber directly beneath the trough serves as a storage reservoir. The reservoir chamber is extended to one side of the line at the delivery end of each acid tank to form a sump and pump chamber (Fig. 3).

Through suitable piping, the hot acid is circulated from the sump through the shallow pickling chamber or trough in a direction opposite to the travel of the strip through the pickler. At the opposite end of the trough, the acid flows through suitable openings back into the lower chamber for recirculation.

The concave shape of the pickling chamber trough supports the strip along the edges and exposes both top and bottom surface of the strip to the flowing acid. There is no scratching of the strip surfaces.

Following the second acid tank, the pickled strip passes through a double set of pinch rolls between which is mounted a high-pressure cold water spray. The water from this spray is wasted and carries with it that small amount of acid that was not removed from the strip by the first set of rubber covered pinch rolls (Fig. 4).

From the cold water spray chamber the strip passes through a hot water tank which removes the last trace of acid. The heated strip then passes through a hot air flash drier and then into the recoiler (Fig. 5).

Anyone seeing this line for the first time is impressed by the clean-cut and tidy appearance, accessibility of all parts and the absence of overhead fume ducts. Fumes are collected at the end of each tank by compact hoods. The fumes are drawn by suction into a combination fume duct and sewer, which sewer is mounted alongside the pickler just above floor level. This large sewer drains into a central exhaust pit where the liquid is drained to a neutralizing tank and thence to the sewer. The fumes are

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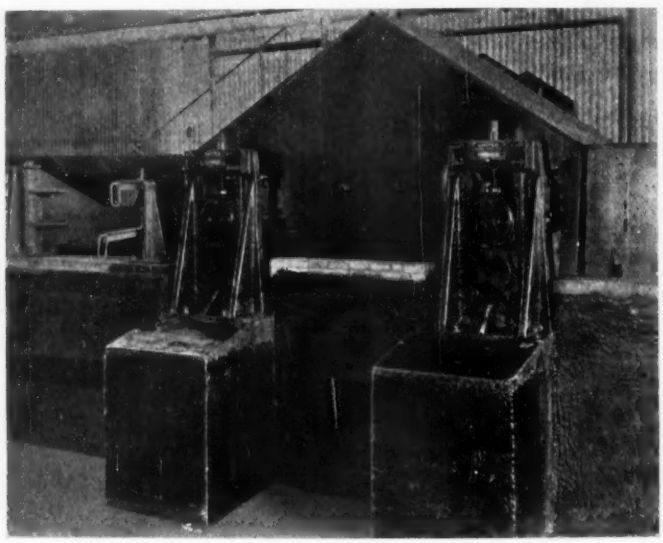

Fig. 4. Rubber covered pinch rolls are mounted on concrete pedestals.

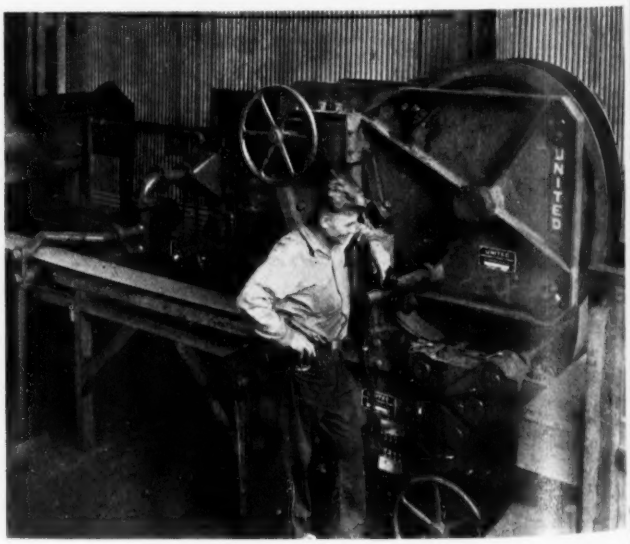

Fig. 5. Strip being recoiled after drying. Exit of hot air flash drier is seen at extreme left.

Counter Current on Zinc Anodes

By R. O. HULL

Electroplating Division, E. I. duPont de Nemours & Co., Cleveland, Ohio

Introduction

EVERY successful user of cyanide zinc plating, particularly bright zinc plating, is cognizant of the necessity for maintaining the zinc content of his baths within quite narrow limits for production of good quality deposits at high cathode current efficiencies. If the zinc content drops too low for the corresponding cyanide concentration, efficiency suffers markedly; if it rises too high, deposits are irregular and dull in appearance. No attempt is made herein to define the limits of zinc metal, since this information is available in operating manuals and textbooks describing the various available processes.

Since zinc is the most chemically active metal commonly plated, maintaining its concentration in the plating bath at a constant level has proved quite troublesome. This difficulty has led to devising various expedients to make concentration control as simple and foolproof as possible. To overcome chemical attack of zinc, anodes containing mercury or mercury plus aluminum[1] may be used for limited application. However, mercury in zinc deposits is not permissible in many cases and it must be entirely absent from bright zinc plating baths. Control of anode efficiency during production is effectively accomplished by alloying zinc anodes with magnesium[2] or calcium,[3] but although these alloying elements do not affect deposit characteristics, they also do not influence or inhibit the rate of chemical attack of zinc during periods of idleness of the bath. Heretofore, the only certain method for preventing chemical attack of zinc has been complete removal of all the anodes from contact with the plating solution, which involves considerable labor and time for installations comprising several thousand gallons of plating bath and several thousand pounds of anodes. If steel baskets for zinc ball anodes are used, the problem may be even more serious because of the accelerated rate of attack of zinc in direct electrical contact with the steel containers, in which case the zinc metal content may rise noticeably over a period of a few hours.

[1] U. S. Patents 1,435,875 and 1,887,841.
[2] U. S. Patent 2,243,696.
[3] U. S. Patent 2,214,331.

Counter Current for Eliminating Chemical Attack of Zinc

During the course of investigation of zinc plating, it was discovered that a small counter current applied between a zinc anode (as cathode) and a steel plate in the bath (as anode) is highly effective in eliminating chemical attack of the zinc. The idea of electrolytic prevention of corrosion of metals is not new, having been used for many years to protect steel pipe from soil corrosion, but extension to plating baths is believed to be novel.

Upon first consideration, it might be anticipated that a fairly high current density would be required to accomplish the desired result, but, surprisingly, a current density of only 0.15 amp./sq.ft. of anode area reduces the rate of chemical attack by about

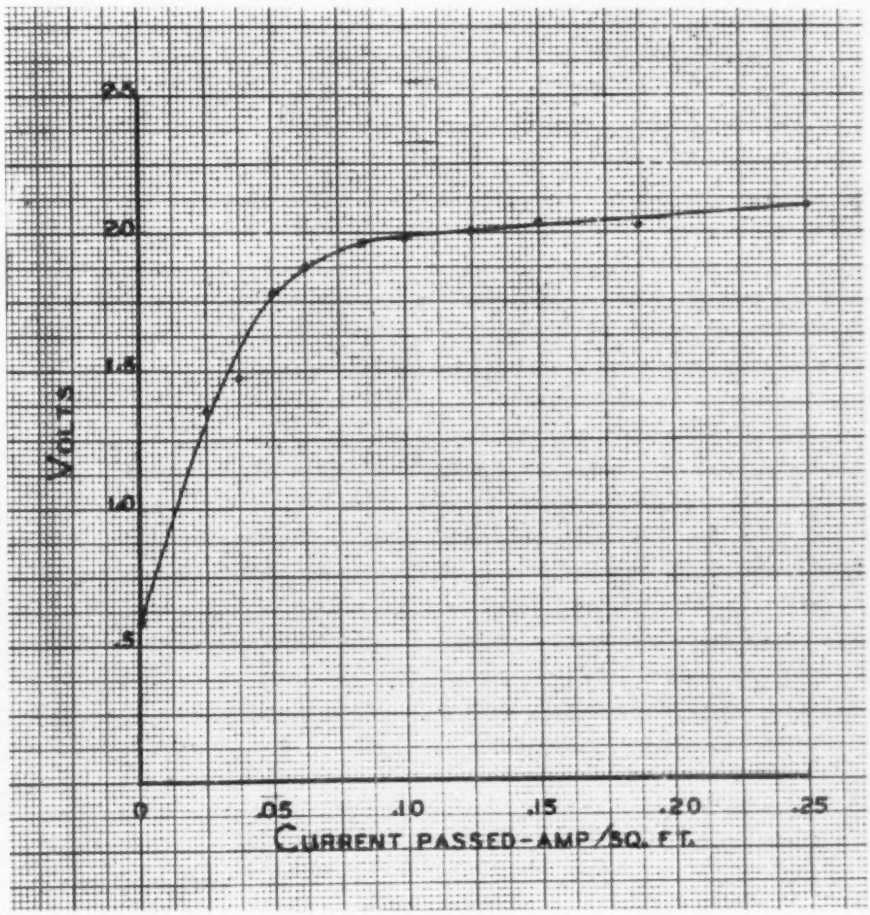

Fig. 1—Current-voltage relationship steel anode-zinc cathode in zinc bath.

90%, and 0.20 amp./sq.ft. eliminates any zinc passing into solution. This is true even when the zinc is in contact with steel such as with anode baskets. Because of the potential relationships between zinc and iron and polarization of iron or steel, about 2 volts must be maintained across the zinc anodes and steel to pass the necessary current. Hence for most installations, only a 2 volt storage battery, charged constantly with a small rectifier, suffices. The total current required for a 1,000 gallon still tank is approximately 1¼ amperes, and a 1,000 gallon barrel tank with more anodes requires about 2½ amperes. When the 2 volts potential is first applied between the steel plate and zinc, a sudden surge of current is noticed, which rapidly diminishes as the steel anodes polarize. More than 2 volts is not desirable, because then the zinc is slowly plated onto the zinc anodes.

A light-gauge steel sheet should be used having at least one-half of the area of the zinc anodes, or about 3 to 6 sq. ft. (both sides) for a 1,000 gallon tank. The sheet, which should not be greater than 3 feet from any of the zinc, may be hung on the cathode busbar when the bath is not in production. Alternatively, the plating tank itself, if it is plain steel, may be used as anode instead of the steel sheet, provided zinc has not been plated on the tank sides, but the steel sheet is recommended in preference. The steel will last indefinitely, since it is not attacked either chemically or electrochemically.

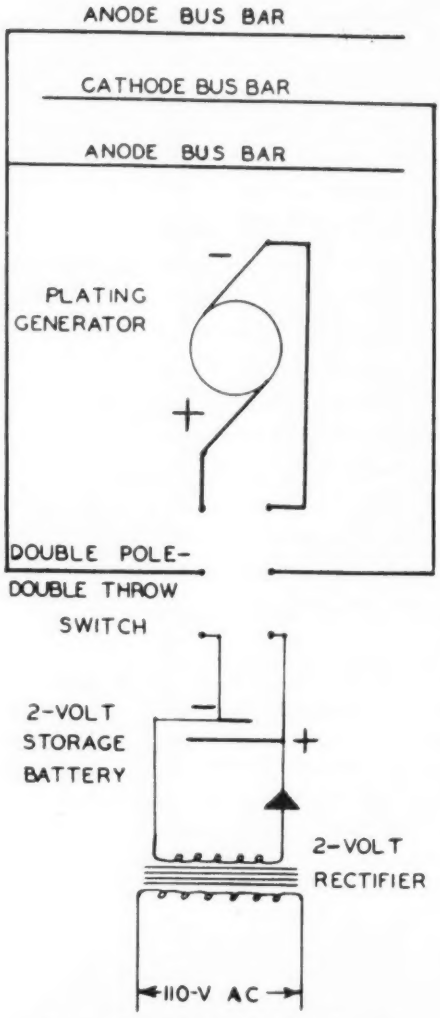

Fig. 2—Counter-current wiring diagram.

A simple wiring diagram is shown in Figure 2. The double-pole, double-throw switch is closed on the generator side and open on the counter current side when the tank is in production. When the bath is idle, the steel sheet is hung on the cathode bar, and the switch closed for the counter current, the generator side being open. If the rectifier is designed to give a taper charge, it may be left permanently plugged into the 110-volt AC line and across the storage battery.

After the zinc bath is used for a period of time, a certain amount of anode sludge may accumulate, but this gradually disappears upon application of a counter current, and usually in 30-45 minutes, anodes are again clean. A counter current in no way affects the desirability of using special anodes such as zinc-magnesium or zinc alloyed with other metals for special purposes.

It is believed that electroplating plants will find the use of a counter current advantageous in overcoming in large part one of the most troublesome factors in maintaining zinc metal within the limiting range of concentration for proper operation.

Semi-Continuous Pickling of Strip

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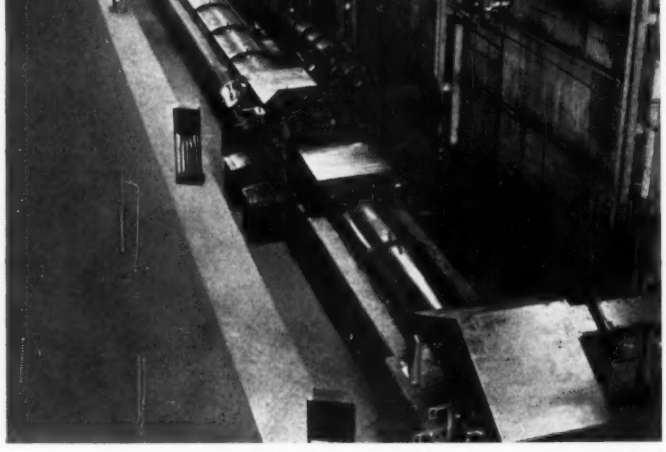

Fig. 6. View of part of pickling line showing method of exhausting fumes and combination fume duct and sewer running parallel to and behind the pickling line.

exhausted by fans through a separate fume stack (Fig. 6). This picture was taken when the line was in full operation and the absence of fumes is apparent.

The semi-continuous pickler has a definite application to small plants similar to the plant of the Bopp Steel Corporation. The line is flexible. The lengths of the pickle tanks are determined by the minimum thickness of the strip. The number of tanks is determined by the tonnage required. The width of the line depends upon the strip requirements of the individual plant.

The line is economical to operate. With proper handling facilities, a crew consisting of a pickle house foreman, two men to operate the line and a crane operator, constitutes the entire crew. Critical materials have been eliminated to a great extent in the construction and as such the entire installation becomes comparatively inexpensive. The tanks are well insulated so that heat losses are low. The maintenance costs are low because of the type of construction and the use of a minimum number of mechanical units.

There has been a great need throughout the industry for a pickler of this type. Because of the low installation cost and the low maintenance and operating costs, the actual cost per ton of pickled steel becomes a very attractive figure.

Determination of Zinc in Cyanide Brass-Plating Baths

By A. S. MICELI and I. O. LARSON

Motor Products Development Laboratory, U. S. Rubber Company, Detroit, Mich.

THE large number of papers on the determination of zinc which have appeared during the past 8 years attest to the widespread need for rapid and reliable analytical procedures for this determination. Of the many methods available for the determination of zinc, only two appear to meet the demands placed on control methods. A control method does not long survive unless it is inherently reliable, rapid, and inexpensive. The two methods found to possess these qualities are: (1) the ferrocyanide titration using diphenylbenzidine as internal indicator[2] with ferric ion held in solution as the pyrophosphate complex[1], and (2) electrodeposition[5]. Where electrolytic equipment is largely tied up by copper determinations, the determination of zinc by ferrocyanide titration is designated. The application of this method to cyanide brass-plating solutions is discussed below. The application of the electrolytic determination of zinc will be discussed in a later paper. Recently[4] the polarograph has been successfully employed for determination of the copper-zinc ratio of electrodeposited brass. The authors do not as yet report its use in the determination of copper and zinc in the brass-plating bath.

Procedure

Centrifuge until clear a portion of the cyanide brass-plating solution to be analyzed, pipet 10 ml. into a 180-ml. electrolytic beaker, add dropwise 10 ml. of concentrated hydrochloric acid, and heat until clear. If the solution is not heated until clear, the ferrocyanide initially precipitated by the acid will not completely redissolve in the next step. Cool and carefully add 7 ml. of a mixture consisting of 3 volumes of concentrated nitric acid and 2 volumes of concentrated sulfuric acid. Evaporate to sulfur trioxide fumes, finally heating over an open flame to cause copious fuming. This step appears essential to assure complete destruction of ferrocyanides and of organic matter. Cool the residual moist salts, wash the beaker sides, add 1 ml. of 1 to 1 nitric acid, and remove copper by electrodeposition.

After the removal of copper, add 3 drops of 5% ammonium persulfate solution to oxidize any ferrous iron to the ferric state. Evaporate to 25 ml. to destroy excess persulfate. Cool, rinse beaker walls, add 2 grams of sodium pyrophosphate to form the ferric iron complex, and finally, 5 ml. of concentrated ammonia. At this point the solution should be alkaline. If not, make just alkaline to phenolphthalein. Neutralize the solution with 1 to 1 sulfuric acid and then add 6 ml. in excess. Warm the solution to 40° to 45° C. At this stage commence vigorous mechanical agitation of the solution. This is essential for the rapid response of the indicator to ferrocyanide additions. Add 3 drops of 1% diphenylbenzidine in sirupy phosphoric acid and 3 drops of 0.2% potassium ferricyanide. The latter addition causes the formation of the violent oxidation product of diphenylbenzidine. Titrate to a permanent end point, using a 0.025 molar solution of potassium ferrocyanide containing 0.3 gram of potassium ferricyanide per liter. The ferricyanide in the titrating solution is essential for obtaining reproducible results and for maintaining a good indicator reactivity.

Limitations and Errors

The successful functioning of the internal indicator requires careful control of the solution composition. However, the determination is not subject to all the limitations cited in the literature. Nitrates can be present to the extent of 0.5 ml. of concentrated nitric acid per 50 ml. of solution. This makes readily possible the use of small amounts of

TABLE. I. EFFECT OF EXTRANEOUS SUBSTANCES ON DIPHENLYBENZIDINE END POINT

Substance (Plus Blank)	Ml. of 0.025 *M* Potassium Ferrocyanide	Effect on Indicator Color Change
Blank (21.6 mg. of Zn^{++} in approximately 50 ml. of soln.)	8.85	Yellow-green end point color change
10 mg. of Pb^{++}	8.85	No effect
10 mg. of As^{+++}	8.85	No effect
10 mg. of Sb^{+++}	8.85	No effect
10 mg. of Sn^{++}	8.85	No effect
10 mg. of Al^{+++}	8.85	Slightly slower color change
20 mg. of Fe^{+++} (as pyrophosphate complex)	8.85	Blue-green end point
40 mg. of Fe^{+++} (as pyrophosphate complex)	8.85	Blue-green end point
60 mg. of Fe^{+++} (as pyrophosphate complex)	8.85	Blue-green end point
10 mg. of Ni^{++}	15.05	(Ni precipitated as the ferrocyanide)
10 mg. of Th^{+}	8.85	No effect
10 mg. of Mg^{++}	8.85	No effect
10 mg. of Ca^{++}	8.85	No effect
10 mg. of SiO_3^{--}	8.85	No effect
20 mg. of SiO_3^{--}	8.85	Color change slow
4 ml. of 1 to 1 HNO_3	9.15	No change
2.5 ml. of 1 to 1 HNO_3	8.90	No change
1.3 ml. of 1 to 1 HNO_3	8.85	No change
10 mg. of Durodex cleaner[a]	8.85	Color change less sharp
10 mg. of Magnus cleaner[b]	8.80	Color change less sharp
10 mg. of gelatin	8.85	No effect
10 mg. of thioglycol	...	No color or end point
10 mg. of acid pickling inhibitor[c] 1	...	No color or end point
2	...	No color or end point
3	...	No color or end point

[a] An alkaline cleaner with about 10% silicate and 0.5% phosphate.

[b] Similar to Durodex but containing a small amount of soap.

[c] The three types of inhibitors used are thought to be:

1, a piperidine derivative.

2, a sulfonated primary or secondary aromatic amine.

3, an aldehyde-aromatic amine reaction product.

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nitric acid as cathode depolarizer in the electrodeposition of copper. The indicator functions properly in a solution containing 4.5 grams of ammonium sulfate, 6 ml. of 1 to 1 sulfuric acid, and at least 20 mg. of zinc ion per 50 ml. of solution. These proportions must be maintained in order to preserve the sensitivity of the indicator. Samples containing less than 20 mg. of zinc ion may require the addition of known amounts of standard zinc chloride solution prepared from metallic zinc.

To determine the effect of extraneous substances in concentrations higher than those encountered in the analysis of a typical plating solution, a standard zinc chloride solution was used.

Each titration sample was prepared by pipetting 10 ml. of standard zinc chloride solution into a 180-ml. electrolytic beaker, adding 4 grams of ammonium sulfate, 6 ml. of 1 to 1 sulfuric acid, and finally the extraneous material to be tested. The resulting solution was diluted to 50 ml., heated to 45° C., and titrated with the ferrocyanide solution.

A common source of indicator trouble arises from the presence of small amounts of surface-active organic matter in the solution. Reference to Table I shows that such material is capable of preventing completely the formation of the colored form of the indicator and must as a consequence be destroyed before proceeding to the zinc titration. Certain common inorganic ions in concentrations as high as 0.2 mg. per ml. of solution do not interfere significantly with the titration. The end point is unaffected and the color change remains sharp, though slight changes in hue may result. A silicate-ion concentration above 0.5 mg. per ml. renders the color change slow and less distinct. In the absence of iron the end point color is yellow-green; in the presence of iron, blue-green. A few trials with solutions of known zinc content will familiarize the analyst with the various stages of the color changes before and at the end point. However, a few hints will aid.[3]

With the initial addition of 3 drops of ferricyanide, a violet color should develop. Lack of color at this point indicates serious divergence from the suggested procedure. A new sample is indicated. With the addition of 0.025 molar potassium ferrocyanide (containing 0.[illegible] gram of potassium ferricyanide per liter), the initial violet changes to blue. As the titration proceeds, the blue color fades to a light shade of blue. At a few milliliters from the end point, this light blue will change through blue-green, then yellow-green, and finally attains a light violet color. The color transitions obtained following the light blue stage depend on the rate at which ferrocyanide is added, on the temperature, and on the rate of stirring. Some stages in the color change may not appear. The color at about 2 ml. from the end point should, however, be violet. Enough time must be allowed for the development of the violet complex, which at 40° to 45° C. is a very sensitive and mobile indicator.

If sufficient time is allowed for its development after each increment of ferrocyanide, the end point can be approached with certainty and precision. The titration requires 5 to 10 minutes. Starting with clear bath solution, the determination of both copper and zinc requires an average of 1.5 hours. A distinct advantage of the suggested procedure is that no transfers are required, the analysis being started and finished in the same vessel.

Acknowledgments

The labor of sifting, by laboratory trials, the present method from among the many methods reported in the literature fell also upon other members of the Motor Products Development Laboratory staff. The authors wish to acknowledge the help of V. F. Felicetta, C. A. Ihrcke, R. E. Mosher, and J. H. Sinclair. They wish also to thank the United States Rubber Company for permission to publish this work.

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Patents

Centrifugal Blasting

U. S. Pat. 2,351,521. W. L. Keefer, assignor to Pangborn Corp., June 13, 1944. In an abrading apparatus, a rotor having a plurality of abrasive propelling blades, the inner ends of said blades being spaced apart to define a central opening, means to feed abrasive into said central opening, and means to transfer said abrasive to the inner ends of said blades comprising a cage-like member formed with a passage in its periphery adjacent the inner ends of each of said blades, and valve means to normally close each of said passages, said member being mounted to rotate about an axis sufficiently eccentric of said rotor axis to bring the orbit of the inner end of the blades within the orbit of said valve means to thereby cause said valve means to be opened by the inner ends of said blades at a predetermined point.

Detergent Mixture

U. S. Pat. 2,351,559. A. Treffler, assignor to Solvay Sales Corp., June 13, 1944. The process for the production of a detergent mixture which comprises incorporating with a mass of finely divided solid particles comprising sodium carbonate, an amount of water sufficient only to form a moist, non-pasty mass with the water diseminated therein and thereafter mixing with said moist, non-pasty mass a finely divided anhydrous phosphate from the group consisting of tetrasodium pyrophosphate and sodium tetra phosphate in an amount such that the phosphate and the moist mass form a detergent mixture which sets to a friable material which is readily broken up into fine particles that are free-flowing and readily soluble in water.

Electroforming

U. S. Pat. 2,351,568. E. O. Wheaton, assignor to Kelly-Wheaton Co., June 13, 1944. The method of producing a dispensing tool having a hollow handle and a bowl portion, said method comprising the steps of providing an electric conductor which in cross section has an endless curved surface pattern of decreasing diameter from a hand-width length in hand grasped dimension and a bowl rim section open laterally from the line of the handle axis which is extended by enlarging the pattern from the decreased diameter portion to merge into the rim for such bowl end-of-the-handle to be closed by the bowl in completing peripheral surface continuity the pattern being an electroplating-receiving terminal continuous surface from the handle portion to and including the rim portion submerging such pattern in an electrolytic bath provided with a suitable anode, and electroplating thereon a handle and a rim portion integral with each other and of such thickness as to be self-sustaining, separating the electroform from the pattern, and finishing the rim as bounds for a bowl.

Cylinder Plating Apparatus

U. S. Pat. 2,351,586. S. Coulson, June 20, 1944. In an electroplating apparatus having a cylindrical rotatable cathode, a container for electrolyte beneath the cathode with the electrolyte partially immersing said cathode

and a support arranged below the immersed portion of the cathode and substantially coaxial therewith, the combination with the aforesaid support, of an anode assembly comprising; sheets of stripped copper shell in face abutting relation to one another carried by said support and substantially coaxial with the cylinder, a filter overlying said copper sheets and substantially coextensive therewith, a grid bearing down upon the filter to hold the filter and copper sheets in substantially uniform arcuate spaced relation to the surface of the cylinder.

Abrasive Blasting

U. S. Pat. 2,351,671. C. A. Driesbach, assignor to Standard Radial Blast Corp., June 20, 1944. A scouring-device for metal-scouring machines, having an elongated undulated scouring-passage constructed and arranged to have granular abrasive introduced into one end of said passage; said device having openings at a plurality of spaced-apart locations along said passage constructed and arranged to direct gaseous fluid into said passage in a direction generally longitudinal of said passage to repeatedly accelerate the abrasive longitudinally along said passage to cause the abrasive to be repeatedly deflected against work in said passage; and separate fluid-control means for independently controlling the entry of gaseous fluid at each of said spaced-apart locations, through said openings.

Degreasing

U. S. Pat. 2,351,704. W. D. Phillips and R. A. Van Fossen, June 20, 1944. In a degreasing cabinet employing solvent vapor and having a hollow inward rim adapted to be used as a solvent reservoir and condenser; a cover comprising a relatively thin rectangular panel including a pair of downwardly extending outside flanges having their opposite wall portions spaced apart a distance greater than the outside dimension of the cabinet; and an inside flange on one side of the rectangular panel, said inside flange being of a length less than the inside dimension of the cabinet and of a width greater than the width of the cabinet rim to provide a vapor baffle when the cover is in closed position and a protective cover for the hollow rim when in open position.

Metal Coating

U. S. Pat. 2,351,798. P. P. Alexander, June 20, 1944. The process of coating a body at least the surface portions of which are formed of a metal which consists at least in part of copper with an alloy consisting at least in part of titanium which comprises, coating the surface of the body with a thin layer of the titanium hydride in powdered form, applying heat to the body and the powdered titanium hydride in an atmosphere of hydrogen and maintaining the temperature of the body and titanium metal above 878° C. but below the melting point of copper until the copper and titanium metal diffuse into one another and flow over the surface of the body.

Dust Collector

U. S. Pat. 2,351,864. G. B. Linderman, Jr., June 20, 1944. In a dust collector, in combination, a stationary frusto-conical receptacle having its larger end upward and having an outlet aperture at its lower end, a closure for the upper end of said receptacle, said closure being formed to provide a helical conduit opening into said receptacle at its upper end, and means for introducing water and dust-containing gas into said receptacle through said conduit.

Electroplating Bearing

U. S. Pat. 2,352,346. C. Sciffl, June 27, 1944. A bearing element having a bearing surface and a second surface extending inwardly from said bearing surface toward the axis of the element and meeting said bearing surface at an angle, and an electrodeposited coating extending continuously on both of said surfaces.

Vitreous Enamel

U. S. Pat. 2,352,425. A. J. Deyrup, assignor to E. I. duPont de Nemours & Co., June 27, 1944. A lead-free, vitrifiable ceramic glaze composition suitable for decorating glassware and maturing below about 1150° F. to a glossy decorative surface coating, said glaze composition comprising aluminum oxide present in amounts ranging from 12 to 17 mole per cent; boric oxide present in amounts ranging from 25 to 40 mole per cent; silica present in amounts ranging from 5 to 25 mole per cent; at least one of the oxides of an alkali metal having an atomic weight below 40 present in amounts ranging from 13 to 24 mole per cent; and an oxide selected from the group which consists of barium oxide, strontium oxide, calcium oxide, magnesium oxide and zinc oxide present in amounts ranging from 6 to 20 mole per cent, all mole percentages being based on the total weight of said glaze composition.

Galvanizing

U. S. Pat. 2,353,019. C. P. Dyer, assignor to Monsanto Chemical Co., July 4, 1944. In the manufacture of galvanized steel objects the method of preparing the objects for galvanizing which comprises pickling them in an aqueous acid solution containing an inhibitor and then etching them by applying a relatively uniform film of an aqueous ferric sulfate solution and permitting the film to react with the steel, removing the reaction products and then galvanizing the article.

Electropolishing Baths

U. S. Pat. 2,348,359. H. A. H. Pray, assignor to Battelle Memorial Institute, May 9, 1944. The method of restoring lost operating efficiency of a used electrolytic polishing bath which contained originally from 15 to 20 per cent sulfuric acid and from 63 to 67 per cent phosphoric acid, by weight, the balance being largely water, and which also contains nickel salts dissolved anodically during use, which method comprises heating said bath to a temperature between about 180° F. and the boiling point of said bath, allowing said bath to cool, and removing precipitated nickel sulfate therefrom.

Electrolytic Polishing

U. S. Pat. 2,349,843. G. J. Beckwith, assignor to The American Steel & Wire Co., May 30, 1944. An electrolyte for use in the anodic polishing of stainless steel, consisting of an aqueous solution containing in the finished solution, between 80% and 90% by weight of orthophosphoric acid of 85% grade, between 10% and 20% by weight of sulphuric acid of 60° Baumé, and .03% by weight of fluorescein dissolved in ethyl alcohol amounting to .37% by weight of the electrolyte, the balance of the electrolyte being water.

Hardening Vitreous Enamel

U. S. Pat. 2,353,165. I. Kreidl and W. Kreidl, July 11, 1944. In the process for improving the apparent surface hardness of the vitreous enamel coat of enameled articles the step of subjecting the enameled article after the usual firing process to a second firing process at a higher temperature and for a shorter time than in the first firing process so that at least a substantial part of the gas bubbles in the surface layer of the enamel coat is released while the gases in the lower layers thereof are substantially retained.

Tumbling Barrel

U. S. Pat. 2,353,637. L. W. Barnes, assignor to The Baird Machine Co., July 18, 1944. A tumbling barrel comprising a stand, a housing mounted on said stand to swing in a vertical plane, a main drive shaft in the housing, a barrel for the work mounted on the shaft, a worm gear on the shaft, said housing having a sump for oil below the shaft into which the lower part of the gear extends, bearings in the housing for the shaft on opposite sides of the gear, a worm meshing with the gear at the upper part thereof above the shaft, inner walls of the housing being arranged to collect oil thrown laterally by the worm and conduct it to the bearings, and means for driving the worm.

Stripping Anodized Aluminum

U. S. Pat. 2,353,786. E. Ross, assignor of one-third to R. J. Horsefield, July 18, 1944. A method for stripping oxide film from parts made of aluminum and its alloys which comprises immersing said parts in a solution consisting of approximately 8.2% sulphuric acid, approximately 5.2% phosphoric acid, approximately 2% chromic acid, and approximately 84.6% water, then rinsing said parts in clear, cold water, and then dipping said rinsed parts in hot water.

Evaporation Films

U. S. Pat. 2,354,521. C. W. Hewlett, assignor to General Electric Co., July 25, 1944. An apparatus for producing coatings by condensation of vapor comprising a perforated, substantially spherical evaporator shell, a holder spaced centrally of said shell containing a substance to be vaporized, a heating element located in the space between said evaporator shell and said holder, a frame within said shell in rigid connection therewith, means to mount said heating means insulatingly on said frame, substantially spherical support for articles to be coated, said support being spaced away from and substantially parallel to the exterior surface of said evaporator and a sealed envelope which is adapted to be evacuated enclosing said elements.

THIS IS WASHINGTON–

By George W. Grupp
METAL FINISHING's Washington Correspondent

Baltimore-Washington Branch is Planning for a Big Year Ken Huston, President of the Baltimore-Washington Branch of the American Electroplaters' Society, has begun to lay out the program for the 1944-1945 season. Meetings will be held in Washington during the months of October, December, February, March and May. The November, January and April meetings will be held in Baltimore. To increase the attendance at the meetings he will shortly appoint an attendance chairman for each meeting. At the end of the season a prize of $10 will be awarded to the chairman who brought out the largest attendance. Librarian Walter Olson expects to release shortly a list of the speakers for the 1944-1945 season. And Secretary-Treasurer Raymond Stricklen is on his toes to see that members pay their quarterly dues in advance. From present indications the forthcoming season is expected to be one of the best in the history of the Branch.

Bright Future for Metal Industry Is in the Cards It is believed by informed persons that the metal finishing industry will be in "paradise" with the coming of peace. In the first place the electroplating and anodizing manufacturers will not find it necessary to reconvert their plants since they did not undergo conversion at the beginning or during the war. Therefore, they are in an excellent position to supply the needs of the industry both promptly and adequately. And platers, those who reconvert mentally, put aside their rule-of-thumb methods, and are alert to the possibilities, should have plenty of business because of deferred civilian purchases and because of the new uses of plating which were introduced during the war.

Reasons for Denial of Platers' Equipment Reduced to Three It should interest the metal finishing industry to know that under the present set-up it is not as difficult to get an approval for electroplating and anodizing equipment. Up until recently there were seventeen reasons for which equipment could be denied. Now those reasons have been reduced to three. This not only makes life more bearable for the platers but it also simplifies matters for the WPB field office officials.

Electroplating Equipment Definition to be Revised Limitation Order L-123 which was revised on July 14, 1944, at this writing is again in the process of revision. In fact the amended order may be issued before this is in print. Upon good authority it was learned that Order L-268 which controls oxy-acetylene apparatus will be revoked and the control of such equipment will be placed under L-123. Item 24 of List A of L-123, which deals with electroplating equipment, will be revised for the purpose of deleting from the definition of electroplating and anodizing equipment such items as temperature controllers and regulators, meters, controls, and recording instruments.

Electroplating Equipment May Be Obtained on Unrated Orders Even though electroplating and anodizing equipment is not mentioned in Priorities Regulation 24 issued on July 29, 1944, yet platers' equipment is covered by the regulation. Of course, the regulation is of no special advantage to platers who need new equipment to expedite their war contracts since they can get replacements of equipment more quickly under MRO procedure. But this regulation is of special importance to manufacturers who have plating departments. They can make application and secure electroplating and anodizing equipment and store it in their plant until they are ready to convert from war-time to peace-time production. According to PR 24, Section C, this is how a buyer goes about this business of getting an unrated order for electroplating and anodizing equipment: "A person who wishes to place an unrated order in spite of the restrictions of the WPB order on List A may apply for War Production Board approval by filing a letter in triplicate with his nearest War Production Board field office with a list in triplicate attached giving a description of the equipment which he wishes to get, including make, type, size, and approximate price. Approval of the War Production Board will be given on Form GA-1977 if it finds that no suitable existing excess equipment is available. Upon receiving War Production Board approval, the person placing the unrated order must endorse the following statement on his purchase order, signed either manually or as provided in Priorities Regulation 7: 'This order approved by the War Production Board in accordance with Priorities Regulation 24.' The standard form of certification contained in Priorities Regulation 7 may not be used. Approval by the War Production Board under this paragraph does not give the purchase order a rating of AA-5 under Section 944.1 (b) of Priorities Regulation 1." This regulation permits the purchase of 15 specific types of capital equipment to enable companies to get ready for post-war civilian goods production.

75 Limitations Eased for Reconversion Purposes The War Production Board issued Priorities Regulation No. 25 together with Direction No. 1 to the Regulation on August 4, 1944. This Regulation authorizes WPB field officials to permit local manufacturers to resume, in a limited amount, the production of 75 different items for civilian consumption. These items range from amusing and gaming machines to vacuum cleaners, from enameled and galvanized ware to umbrella frames, from alarm clocks and flatware and hollowware to metal household furniture. In referring to the seventy odd different WPB orders which this Regulation covers it warned that "if one of the following orders is amended to refer to Priorities Regulation 25, authorization under the regulation will affect the provisions of the order only to the extent provided in the amended order." It also pointed out that not until the orders have "been specifically amended to provide otherwise, authorizations granted under this regulation will give relief only from the provisions of the order which either prohibit manufacture entirely or

restricts the amount of manufacture permitted." This regulation was issued as a reconversion step which permits qualified persons to resume essential civilian production. The sections of this regulation which are of special importance to the metal finishing industry are Section 944.46 (d); (e) (4); and (f) (1).

Rice to Study Electroplating Manufacturers Needs and Problems To get a better understanding of the current needs and problems of the metal finishing trade, Charles Rice, Chief of the Electroplating and Anodizing Section of the WPB, will visit and talk with the industry's leaders in such cities as Boston, Buffalo, Chicago, Detroit, Philadelphia, and New York during the month of September.

McNutt and Nelson Issue Joint Statement on Civilian Production Donald M. Nelson, Chairman of the War Production Board, and Paul V. McNutt, Chairman of the War Manpower Commission, issued a joint statement on August 15, 1944, to make clear their joint agreement on reconversion to civilian production. It is agreed that war production comes first both as to manpower and materials. Both agree that maximum resumption of civilian production should be undertaken provided it does not interfere with war production.

Alarm Clock Production Increased in 1944 Second Quarter The Non-Jeweled Clock and Watch Manufacturers Industry Advisory Committee were told by WPB officials on July 27, 1944, that about 25 per cent more spring-driven war alarm clocks were produced in the second quarter of 1944 than in the first quarter of 1944.

New Alien Patent Committee Headed By Lewis Ben W. Lewis on July 28, 1944, was appointed chief of the Patent Contracts Committee in the Office of Alien Property Custodian. One of the functions of the committee which Mr. Lewis heads is that of eliminating restrictive provisions from patent contracts entered into between American concerns and foreign owners of patents which have been seized by the Federal Government.

Aluminum Household Articles Production to be Increased Members of the Aluminum Utensils Industry Advisory Committee at its August 4, 1944, meeting discussed the possibility of limited production of household and commercial cooking utensils and certain other household articles. As a result of this discussion WPB officials have begun to draft an order which will permit such production.

Aluminum and Magnesium Shifted on Substitution List Material Substitutions and Supply List No. 13 was issued on July 15, 1944, by the Conservation Division of the WPB. In this new List aluminum and magnesium was shifted from Group II to Group III. In other words these two commodities were removed from the group of materials currently in balance between supply and demand to the group of materials that exceed current war and essential needs. Copies of List No. 13 may be obtained by addressing the Editor, Material Substitution and Supply List, Conservation Division, War Production Board, Room 2511, Temporary D Building, Washington 25, D. C.

Aluminum Regulations Eased The WPB announced on July 31, 1944, that Inventory Directions 11 and 14 have been revoked. Direction 18 was issued to permit users to re-schedule their aluminum and aluminum alloy inventory positions. It is now permissible to accept deliveries of small amounts of such materials without violating inventory restrictions in Controlled Materials Plan Regulation No. 2.

Band Instrument Makers Wish to Make Parts On July 31, 1944, members of the Band Instrument Industry Advisory Committee urged the WPB to grant permission to resume the production of parts and sub-assemblies for band instruments for civilian uses. It is the opinion of members of the committee that the production of parts and sub-assemblies for eventual assembly into civilian band instruments could be carried out without taking labor, material or facilities from war production. It is also their opinion that unless some parts are on hand when reconversion is begun, workers trained to do sub-assembly work will be idle while parts are being produced. In reply the WPB officials said that such materials as copper, nickel, steel and leather are critical. Therefore they recommended that the industry explore the possibilities of using aluminum.

Cadmium Order Amended General Preference Order M-65 was amended on August 8, 1944, for the purpose of allowing additional uses for low-melting point alloys containing cadmium. The amended order permits the use of one-half per cent cadmium in zinc and zinc type metal alloys. And it clarifies the appeals provisions applicable to cadmium.

Captive Repair Shops Interpretation No. 4 to CMP Regulation 9A issued on July 27, 1944, states that "CMP Regulation 9A includes 'captive repair shops.' This includes 'captive repair shops' owned by any person, including a farmer, which meets the requirements of the regulation." In other words to obtain materials such shops which meet the requirements of the regulation are eligible to use the preference ratings and allotment numbers or symbols to which their owners are entitled to as well as those assigned under CMP Regulation No. 9A.

Construction Means Repairs Interpretation No. 3 to Controlled Materials Plan Regulation No. 9A was issued on August 4, 1944, to make clear that the term construction "means the putting up, altering or repairing of any sort of structure including a building, road, bridge, dam, sewer and similar jobs. It also includes the installation of equipment or fixtures in such structures." And the term construction also includes "repairs."

Rules on Copper Inter-Liners Issued Direction No. 2 to Conservation Order M-199, issued on August 7, 1944, permits manufacturers of rolled gold plate and gold filled stock containing more than one-half of one percent of silver by weight, exclusive of the silver content of the karat gold, to use copper inter-liners in the making of such items as fountain pens, mechanical pencils and watch cases. This direction places the manufacturers of these goods on the same basis as manufacturers of jewelry.

Critical Construction Materials Design Guide Revised The Conservation Division of the WPB issued on August 3, 1944, a revised edition of the "Critical Construction Materials Design Guide." This guide, which is intended for persons applying on Form WPB-617 for permission to begin construction, is a supplement to Schedule A, Controlled Materials Plan Regulation 6. Copies are available at all WPB regional and district offices.

Experimental Material Made Available Preference Rating Order P-43 was amended on July 22, 1944, and Priorities Regulation No. 23 was issued on the same day to enable qualified persons to get materials to make models and to carry on scientific and technological experiments for post-war products.

Excess Materials and Products Procedure A procedure has been established by the WPB whereby a person with excess materials or products on hand may get permission to use such products or materials himself rather than sell them under WPB special sales pro-

cedure. This new procedure applies (a) to Class A products and controlled materials, and (b) to other products and materials. Directive No. 52 on CMP Regulation No. 1 as issued on June 22, 1944, governs Class A products and controlled materials; and Directive No. 4 to Priorities Regulation No. 1 governs other materials and products. All persons having products and materials governed by these directives may now apply to their local WPB office to get permission to use such products and materials for purposes other than that for which they were acquired. The application must be by letter, in duplicate, describing "the material you want to use, what you want to use it for, how you got it, and other relevant circumstances."

Gardner Resigns and Haile Appointed Fred W. Gardner resigned as director of the General Industrial Equipment Division on July 29, 1944, to accept an appointment with the State Department. William M. Haile was appointed to succeed Mr. Gardner.

Gold and Palladium Restrictions Removed In revoking Order L-45 on August 14, 1944, restrictions on the use of gold and palladium in the manufacture of jewelry were removed.

Government Owned War Plants Being Studied for Peace-Time Production Purposes Secretary of Commerce Jesse H. Jones revealed on July 27, 1944, that the Defense Plant Corporation, a subsidiary of the Reconstruction Finance Corporation, for some time has been quietly making industrial surveys of its many and varied plants for disposition and conversion to civilian production. These surveys include detailed engineering reports on the plants, details on costs, photographs, maps, plant layouts, information on taxes, utilities, transportation, raw materials and studies of convertibility to peace-time operations. He warned that prospective buyers of plants should not expect basement bargain sales. The prices asked will be fair; and where private financing is not available the RFC stands ready to supply all necessary and proper support.

Hot-Dip Galvanized Products Committee On August 8, 1944, the Office of Price Administration appointed a Hot-dip Galvanized Products Industry Advisory Committee which consists of A. J. Blaeser, Joslyn Manufacturing and Supply Co., Chicago, Ill.; R. B. Bolles, Commercial Metals Treating Inc., Toledo, Ohio; F. C. Brightly, Jr., Standard Galvanizing Co., Chicago; E. B. Byles, James Hill Manufacturing Co. Inc., Providence, R. I.; F. M. Carlson, American Tinning and Galvanizing Co., Erie, Pa.; K. F. Forsyth, Emsco Derrick and Equipment Co., Los Angeles, Cal.; G. I. Gregory, Thomas Gregory Galvanizing Works, Maspeth, N. Y.; H. W. Hake, Hake Galvanizing Works, Harvey, La.; H. Hofkin, Penn Galvanizing Co., Philadelphia; P. Ingersoll, Wilcox Crittenden & Co. Inc., Middletown, Conn.; W. H. McKenna, Hanlon-Gregory Galvanizing Co., Pittsburgh, Pa.; and J. B. Tate, The Witt Cornice Co., Cincinnati, Ohio.

Iridium Order Eased Because of an increase in supply of iridium, Conservation Order M-49 was amended on July 21, 1944, to release some of this material from allocation. In the future, requests for permission to use iridium Form WPB-2680 is no longer necessary. Reports on Form WPB-2679 have been discontinued. But it should be added that the amended order forbids the sale, delivery, purchase or receipt of iridium except for the permitted uses as provided in the regulation.

Materials for Conversion Eased Preference Rating Order P-89 was amended on July 29, 1944. In fact the Order was almost completely rewritten to meet present conditions. The amended order now provides that "Blanket ratings or allotments assigned under this order may be used to obtain material required for rearrangement of an existing installation, for adaptation of an existing installation to a different process, or for installation to a different process, or for the installation of new machinery or equipment, if the cost of the required material (not including cost of used material) does not exceed $1000 for each complete job."

Murphy Resigns and Stauss Takes Over W. S. Murphy, Chief of the Gold and Silver Section of the WPB's Mineral Section resigned on July 21, 1944, for the purpose of engaging in private business in New York City. Henry E. Stauss of Millburn, New Jersey, was appointed to succeed Mr. Murphy.

Musical Instrument Makers Want Allocation Restrictions Removed At a joint meeting of the Musical Instrument Accessory and Supply Manufacturers Industry Advisory Committee and the Miscellaneous Instrument Manufacturers Industry Advisory Committee in Washington on July 27, 1944, the members of both committees requested permission to resume the production of musical instruments and accessories. The committees recommended that Limitation Order L-37-2 be amended to remove the restrictions on the production of musical instruments and accessories containing more than 10 per cent of critical materials by weight. They also recommended the removal of restriction on the use of material from idle and excess inventory.

Porcelain Enameled Product Sales The Bureau of the Census of the Department of Commerce reports that the value of shipments of porcelain enameled products, such as signs, stove parts, refrigerator parts, reflectors, and cooking, hospital and household utensils for the first six months of 1944 amounted to $16,642,079 as compared with $14,840,668 for the same period in 1943.

Safety Course Offered to Workers The National Committee for the Conservation of Manpower in War Industries has now made available to workers a specialized 64 hours educational course in industrial safety principles. Classes for this course are arranged as part of the extension activities of universities, colleges and technological institutions throughout the United States. Qualifications for the course are: "High school graduation or equivalent and member of safety committee or in a position, by virtue of his connection with labor, to stimulate action on the part of plant management or workers for the improvement of safe work conditions or practices in war industry." A list of the institutions where this course may be taken can be obtained from the United States Office of Education, Washington, D. C. The course is under the direction of the United States Department of Labor and the United States Office of Education.

Silver Producers' Committee Meets The members of the Silver Producers and Distributors Industry Advisory Committees were told by WPB officials on July 20, 1944, that the consumption of silver —domestic, foreign and treasury, will be about 10 per cent greater in 1944 than in 1945. At this meeting the members discussed the matter of clarifying Order M-129 to overcome possible abuses in the use of silver by small manufacturers and by those employing hand tools. Members of the committee pointed out that Order M-199 should be liberalized to permit wider use of silver for List B items.

How to Expedite Equipment Priorities If cadmium and chromium platers wish to speed up their processing for equipment priorities they can do so by first securing allocations for the materials needed to execute their war contracts. By mentioning such material priorities in their application for electroplating and anodizing equipment they will expedite the approval for such equipment.

SHOP PROBLEMS

PLATING AND FINISHING
POLISHING — BUFFING
CLEANING — PICKLING
HOT DIP FINISHES

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Electrolytic Action

Question: We solder together a bronze bellows and brass end fittings and then fill the complete assembly with a water-alcohol mixture. After this is subjected to high pressure steam from 150 lb. to 200 lb. for a prolonged period of time, we find that the assembly becomes gas filled. We believe that the gas formed is hydrogen. In addition to the formation of gas, we find a plating action inside of the bellows. We are not certain what causes this or how it may be remedied.

If you have any suggestions, they will certainly be welcome.

S. W. P. C.

Answer: Since the assembly contains two dissimilar metals and an electrolyte, there would be a tendency for electrolytic action which would result in the evolution of hydrogen gas and deposition of one of the metals in the alloys, probably tin, on the bellows.

Minimizing this condition would probably require the use of high purity water and alcohol containing no dissolved salts and thorough cleaning of the assembly before filling in order to remove flux which might provide sufficient conductance to the solution being used.

Heating Cyanide Salts

Question: Please advise us what happens when we heat copper cyanide, nickel salts, etc., to boiling point. Do we change the formula? Our plater boils his make up additions in a small tank, so they will dissolve more readily, and then adds the salts of the different solution to the plating tank, that is the concentrated solution. In other words, what happens to the salts of zinc cyanide, copper cyanide, single nickel salts, double nickel salts, and chromic acid, when they are brought up to a temperature of 200° or more?

We understand that a heated water solution will dissolve more salts, but how far should you go with the heat before a chemical change takes place?

R. P. P. Co.

Answer: Boiling of nickel salts and chromic acid to dissolve them will not result in any chemical change. However, if cyanide salts are heated, there is a tendency for the cyanide to decompose so that when dissolving metal cyanides together with sodium cyanide in hot water, it may be necessary to use a larger amount of sodium cyanide than would be theoretically required.

Blackening Gun Barrels

Question: Can you furnish me with a formula to obtain a penetrating deep blue-black color on rifle, revolver and shot gun barrels and parts? Same to be used by the hot bath or boiling of parts in the solution.

I obtained a formula from your magazine for coloring metal bottle tops, etc., but it does not penetrate and can easily be scratched off and would not stand up very well on gun barrels and parts.

E. L. G.

Answer: A typical formula for blackening gun barrels by the so-called "Bronzing" method is as follows:

Ferric chloride	90 g./L.
Mercuric nitrate	90 "
Hydrochloric acid	77 cc./L.
Ethyl alcohol	460 "

The parts are immersed in the above solution for 20 minutes and are allowed to dry for 12 hours without rinsing. This is repeated, after which the barrel is dipped in boiling water for 1 hour and dried. The smut is removed by scratch brushing, and the finish is protected with an oil or wax coating.

A number of formulas for blackening gun barrels will be found in National Bureau of Standards Letter Circular LC 630 (February 1, 1941), and in National Bureau of Standards Circular No. 80 (1922), both of which are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C.

French Gray Finish

Question: It will be appreciated if you will give us a simple formula for a French Gray, gray-black or blue-black for sterling —something which does not require an electroplating outfit. We oxidize with liver of sulphur, but there must be something better.

Can you recommend an inexpensive book on metal (sterling) coloring and enameling?

M. M.

Answer: Liver of sulphur or any of the polysulfides sold under proprietary names may be used. We know of nothing cheaper or better for the purpose.

Two books on coloring may be of interest to you; namely, those of Hiorns and Krauss. The former is out of print at the present time, but may be examined at a local library.

Finishing Iron and Aluminum

Question: I am interested in the plating and finishing of steel and cast iron. Will you please send me all of the detailed information possible on these processes. Which processes can one use at once and which must one receive permission to use? I would also appreciate some literature on finishes for aluminum, if available.

G. D.

Answer: It would be impossible to furnish the information desired in a letter and we can only suggest that you visit the local library and examine some of the literature on electroplating and finishing.

In connection with finishing of aluminum we would suggest that you write to the Aluminum Company of America, Pittsburgh, Pennsylvania, and ask for a copy of "Finishes for Aluminum."

Iron Plating

Question: Enclosed find article of latest results on iron plating of stereotypes. Would you have a formula of this type of solution as your 1943 Guidebook does not carry this latest result?

A. L. J.

Answer: The clipping refers to a paper presented by Schaffert and Gonser at the 84th Electrochemical Society General Meeting. The formula for the solution is as follows:

Ferrous Sulfate	250 g./L.
Ferrous Chloride	42 "
Ammonium Chloride	10 "
Temperature up to 90° F.	
pH 3.5 to 5.5.	
Current Density 30 to 50 ASF.	

Copies of this paper may be obtained at 50c each by writing to The Electrochemical Society, Columbia University, New York, requesting preprint 84-25.

Replating Gauges

Question: Where I am employed, we have chrome plate gages, cutters, drills, etc. It has been the custom to strip, when the work comes out under the required plate. Isn't it possible to replate without stripping, when this occurs?

P. P. E.

Answer: It is possible to replate chromium plated gages, etc., without stripping if no steel is exposed. The article should be given a short reverse current treatment and then plated as required.

If any steel is exposed, it is necessary to remove the coating completely before plating.

NO MORE REJECTS

WHEN SENSITIVE BRASSES ARE CLEANED WITH DIVERSEY D-C No. 44

HELP WANTED!

Here's one "help wanted" problem that's easily solved . . . even in these days of man-power shortages. If it's a problem in metal cleaning and working . . . the Diversey D-Man is always on deck to lend a helping hand. Backed by a Research Laboratory that has spent 18 years developing special purpose products, the Diversey D-Man can often show you ways to step-up production that require less man-power.

Rejects were running as high as 60% in one plant. Then they switched to Diversey D-C No. 44 for cleaning sensitive brass parts prior to electroplating and other finishing operations. Since then the records show not a single reject!

Diversey D-C No. 44 has been specially developed for removing foreign matter from many types of soft metals. When D-C No. 44 is employed at recommended concentrations and temperatures, sensitive brasses can be processed without any danger of etching or discoloration. Unusual saponifying and emulsifying action readily removes oil and grease, while high wetting power quickly "lifts" solid contamination, thereby leaving a chemically clean surface.

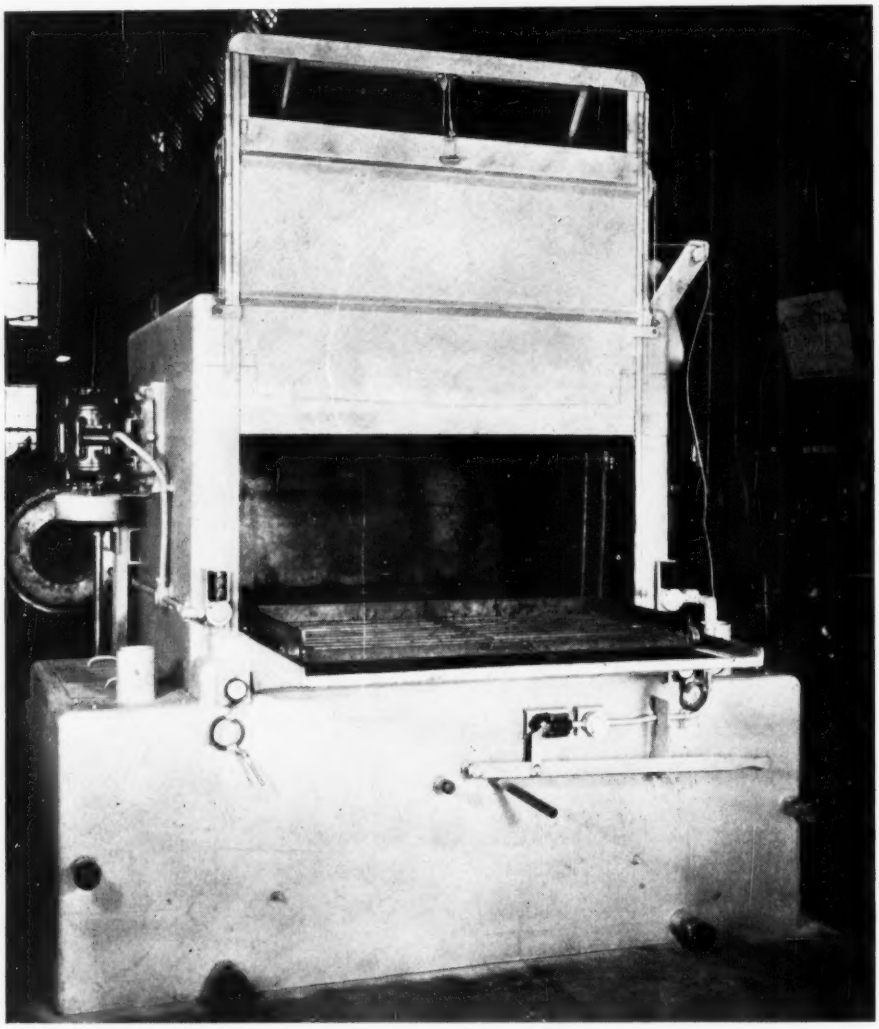
Because of its unique water softening action, D-C No. 44 prevents hard water salts from clinging to the work. It rinses freely and completely . . . leaves no film or scale. Furthermore, D-C No. 44 is buffered to retain its cleaning power over long periods of use.

Diversey D-C No. 44 is a dry, free-flowing concentrated product that gives excellent results over a wide range of cleaning operations. A safe cleaner for magnesium and zinc alloys, D-C No. 44 is also recommended as a medium duty cleaner for iron, steel and copper. It is completely soluble and easy to use in still tank cleaning or mechanical metal washers. For further details address Metal Industries Department.

THE DIVERSEY CORPORATION
53 W. Jackson Blvd., Chicago 4, Ill.

NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY



Walking Spray Washer

N. Ransohoff, Inc., Dept. MF, Cincinnati, has developed a new cabinet type Walking Spray Washer, combining the advantages of compactness with those of efficient operation.

The unit features a "walking spray" which moves back and forth across the work reaching every part of it. Because of this moving spray, it is possible to use a minimum number of spray holes, permitting the use of small low gallonage pumps. This is in contrast to the traditional cabinet washers where sprays had to be located over a wide area in order to insure complete coverage of the work. The increased number of sprays requires larger pumps thus materially increasing both the initial and the operating costs.

The washer may be equipped for wash only or wash and rinse, and a hot air blower may be added for drying, if desired. Where a wash and rinse cycle is indicated, the manufacturer has developed a tilting drain pan which directs the wash water back into the wash tank for re-circulation and, when the pan's direction is changed, directs the rinse water into the rinse tank. An interlocking safety switch prevents the operator from starting either the wash or rinse pumps until the pan is in proper position.

The accompanying photograph shows a Ransohoff Walking Spray Cabinet Washer being used for cleaning rear axle housings. The work is placed on the movable tray, pushed into the cabinet and the door closed. The wash pump is started and the Walking Spray moving back and forth insures complete coverage of the wash. When the wash cycle is completed, the operator shuts off the wash pump, turns the drain pan, and starts the rinse. The machine can be equipped with time switches for automatic operation if desired.

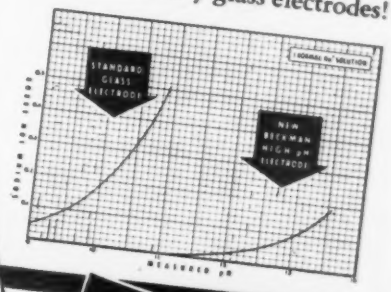
Professional Directory

Check your knowledge of pH

Do you know the answers to these important pH questions?

Q. *There is only ONE make of modern pH equipment with which accurate pH measurements can be made in highly alkaline solutions, even in the presence of sodium ions. Do you know what that make is?*

A. Beckman pH equipment—and *only* Beckman equipment! Note in chart the accuracy of Beckman Type E Glass Electrode in highly alkaline solutions compared with ordinary glass electrodes!



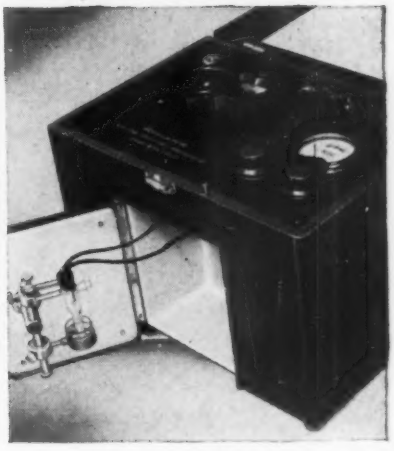
Q. *There is only ONE make of pH equipment with which glass electrode pH measurements can be made in boiling hot process solutions. Do you know the name of this equipment?*

A. Again Beckman—and *only* Beckman! With Beckman High Temperature Glass Electrodes, continuous pH measurements can be made in solutions as hot as 100°C (212°F). This feature is highly important to consider in the purchase of pH equipment for *any* purpose. Even though your present operations may not involve hot solutions, you never know when changes or additions to your operations may obsolete equipment not providing this feature. Buy Beckman to begin with *and be sure!*

There's a Beckman pH instrument for your requirement.

Beckman Automatic pH Indicator
The most advanced pH instrument available for large-scale pH control. Indicates pH completely automatically. Also operates pH recording and control equipment!

Beckman Industrial pH Meter
Combines high accuracy with knockabout ruggedness for portable plant and field use. Gives instant pH readings at the touch of a button. Also *continuous* indication!



Beckman Laboratory pH Meter
Combines high precision with wide versatility to meet every laboratory and research need.

Free! "What Every Executive Should Know About pH"—a helpful factual guide to modern pH control. Send for your copy.

BECKMAN INSTRUMENTS NATIONAL TECHNICAL LABORATORIES
South Pasadena • California

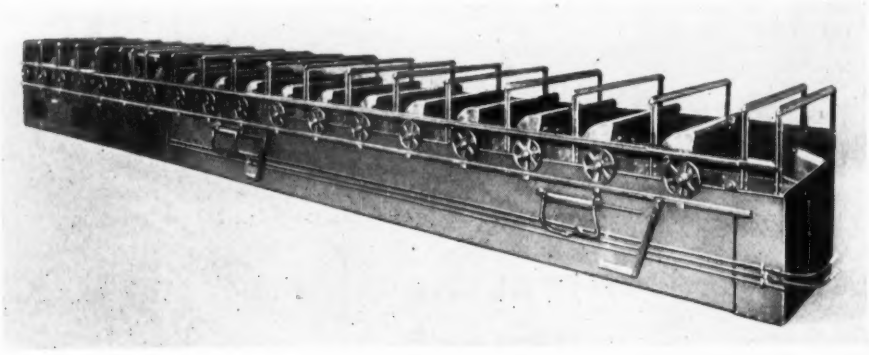
BECKMAN INSTRUMENTS CONTROL MODERN INDUSTRIES

Metal Protective Coating

Wartime materials shortages and the turning of industry to new metals in the fabrication of their products has brought about many new metal finishing problems.

In the solving of these new problems the Udylite Corporation has developed and perfected equipment and processing for Dichromating of zinc coated steel and die cast parts which shows great promise in the post-war field.

Dichromating is not new but in its original processing it presented so many difficulties and hazards that it was practically useless except as a hand dip coating of unpredictable quality.



The new equipment shown below plus a new cycle of processing developed by Udylite research engineers has brought Dichromating to the stature of a real possibility in low cost, dependable finishes for everything from die cast zipper parts to steel shell cases, and a possibility which should not be overlooked in the finishing of peacetime precision parts where eye appeal is not essential.

The construction of the machine shown below is based upon the discovery that absolute control of both time and temperature is vital in producing satisfactory results.

This equipment is fully automatic, eliminating all the irregularities of the old hand dip method and carrying bulk parts through a complete processing cycle by means of a split timed dwell schedule.

Parts being processed are cleaned, rinsed, dipped, drained and dried continuously with dependable results and no scratching or scarring. Nothing can touch it from the standpoint of low cost. Equipment is custom built to meet individual requirements.

For further information write to The Udylite Corporation, Dept. MF, 1651 E. Gd. Blvd., Detroit 11, Mich.

Rust Inhibitor

A new rust preventive coating for protection of metal parts and equipment during storage, shipment, and, in some cases, in service, has been developed by Witco Chemical Company, Dept. MF, 295 Madison Ave., New York 17, N. Y. Known as Witco No. 673 Rust Inhibitor, this new product offers a combination of advantages not heretofore available: it is a cold-dip, rapid drying coating that may be applied either by dipping or spraying, as its viscosity is comparable to that of water. It fully conforms to Ordnance Specifications AXS-673, Rev. 1, Amend. II, is non-abrasive, non-corrosive, and easily removed with ordinary solvents.

One outstanding feature of Witco No. 673 Rust Inhibitor is its extremely high melting point, in excess of 250° F., and yet the coating remains flexible at temperatures of 20° below zero. The product is packaged in standard 55 gallon steel drums.

Porosity Test Paper

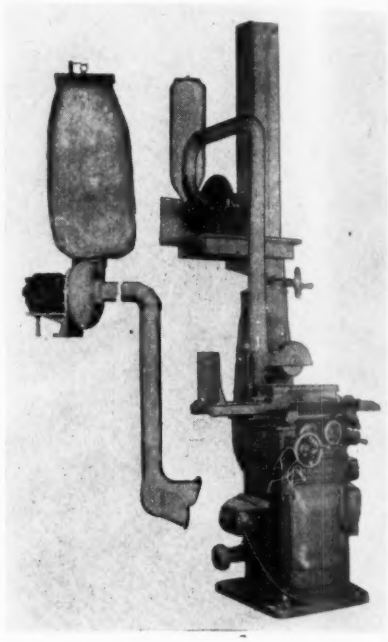
A new test paper for detecting porosity in plated coatings has been announced by the Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J., called Fotopor paper.

Fotopor paper is most commonly used for determining the porosity of nickel deposited on iron and steel. However, it can also be used to test the porosity of chromium, copper, brass and tin over iron and steel; as well as these same metals over copper and brass. Blue spots will appear on the paper wherever iron or steel is exposed, and brown spots in the case of copper and brass.

For some time, the supply of Fotopor paper has been limited, but it is now available in quantities which promise to be sufficient for all requirements. It is furnished in convenient rolls containing 150 lineal feet, 2" wide, providing a total surface area of about 3,600 square inches. The rolls are compact, about 4" diameter; easy to handle; and packed in individual cardboard boxes.

Individual Dust Collector

Leiman Bros. powerful suction dust collector handles 600 cubic feet free air per minute with a ¼ HP motor at 3,500 rpm, stands 47″ high with 9″ diameter dust bag,



3″ pipe and elbows, and dust hood—runs from any electric light socket.

It is adapted for use with grinding and polishing wheels or any other dust creating tools. Leiman Bros., experts in dust collecting units for 50 years, are placing this little device in shops and factories, large and small everywhere. Any shop can afford one or more of them. Send to Leiman Bros., Dept. MF, 125-75 Christie St., Newark 5, N. J., for free information.

Copper Plating Process

An improved high-speed copper plating process which reduces operating costs and speeds up production rates is announced by E. I. du Pont de Nemours & Company, Dept. MF, Wilmington 98, Delaware.

This improvement is a development of the copper-plating process introduced by the Electroplating Division of the company in 1938. The original method utilized a carefully compounded and controlled sodium copper cyanide bath operating at 100 per cent current efficiency and at increased current densities.

The new gains were achieved by working out a method of substituting potassium cyanide and other potassium salts for the sodium salts formerly used with still further increases in current densities. Development of methods for producing the potassium salts in this country, and technical advances in their use in plating baths, made the substitution possible.

War plants already are operating installations of the new process. Makers of tanks, planes, motorized equipment and other military and naval items have adopted it for plating the numerous engine parts and other articles in which the use of copper is essential.

The new process effects savings even

though potassium cyanide is costlier, pound for pound, than sodium cyanide. A smaller amount of the potassium salt suffices to maintain the plating bath at the required strength, and dilute solutions in the new process give results that are equivalent to much stronger concentrations in the old.

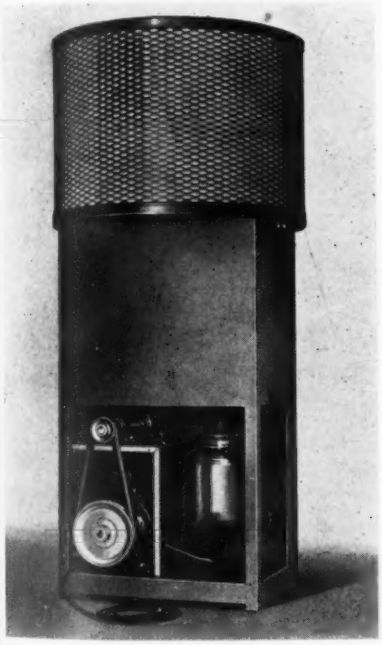
Desired thicknesses of deposit are now acquired in an even shorter plating time. This is made possible by the greater current densities tolerated by the new bath. The new bath is also more stable and easier to rinse.

The increased speed and efficiency give increased production of finished items without a corresponding increase in plating facilities such as tanks and solution volume. Similarly, designers of new installations may use the advantages of the all-potassium process to reduce the size and cost of equipment.

The reduced space requirements, important for war plants, are of timely significance now to the automotive industry with current reconversion plans envisioning more extensive and heavier copper plating as undercoating for the increased use of chromium-finished decorative parts being projected for post-war cars.

Dust Collector

An entirely self-contained portable Dustkop dust collector built especially for operation on either 25 or 50 cycle frequency,



alternating current, but otherwise employing the same cyclone separator and filter combination as the standard Model 950 Dustkop dust collector, which is suitable for medium duty grinding, burring, tapping and other dust creating abrasive operations, is added to its line of portable industrial dust collectors by Aget-Detroit Co., Dept. MF, 602 National Building, Ann Arbor, Michigan.

The minimum fan speed in order to maintain an air velocity and efficiency for such grinding operations must be kept at about 3450 rpm. To accomplish this with standard motors, operating on 25 or 50 cycle frequencies, a vee-belt overdrive is employed. The fan is mounted on a shaft which in turn is carried on pre-lubricated and sealed ball bearings and is driven through the vee-belt from a pulley mounted on the motor drive shaft.

Enthone Zinc Stripper

The Enthone Company, Dept. MF, 474 Elm Street, New Haven, Conn., announce the development of an alkaline stripper called "Enthone Zinc Stripper" for the rapid removal of zinc plate. This new product quickly strips zinc plated coatings of all types and thicknesses of the order of 0.001 will strip in 30 seconds, leaving the metal clean and bright.

Due to the alkaline nature of the solution, the tendency for rusting of the steel after stripping is largely removed, whereas this is a serious problem when acid strips are used. There is absolutely no attack upon the base steel from Enthone Zinc Stripper and the base metal, therefore, is left in its original clean condition after stripping.

The Stripper is effective for removing zinc coatings that have been treated with various chromate processes and for all types of bright zinc plates.

The Stripper is supplied as salts which are added to water in the concentration range of 2-3 lbs., per gal. and the mixture heated from 200 to 215° F. Plain steel tanks and heating coils are used. The Stripper is ideal for removal of zinc from defective plated work and from plating racks, wires and hooks, and is being used in automatic cycles for cleaning of the plating racks.

The Stripper has undergone extensive commercial trials for the past nine months and patents are pending.

Ingenious New Technical Methods

Presented in the hope that they will prove interesting and useful to you.

Amazing New Four Spindle Turret Attachment for Drill Press!

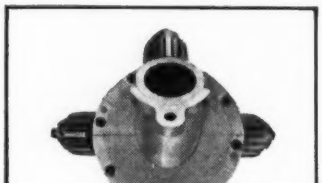
Now one drill press can do the work of four and, at the same time, effect a savings of up to 75% in floor space, with the "Quadrill" attachment. This rotary device will accommodate four boring or cutting tools at the same time, yet one tool *only* is in motion when the head is in operating position.

The entire unit is assembled to the quill of the drill press and is driven from the drill press spindle. Accuracy and rigidity of alignment of the "Quadrill" are assured by the special construction of the driver and spindles, thus efficiency is only limited by the accuracy and power of the drill press itself.

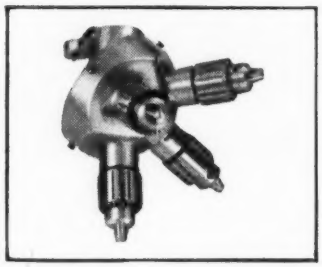
Foolproofing in indexing is accomplished by visual markings and by the relationship of the index pointers on the index disc, as well as the extension of the spring retainer. Four hardened and ground spindles are fitted for No. 32 Jacobs chucks or their equivalent. To provide correct positioning at all times, the entire spindle assembly is located by means of an accurate fitting of recess and undercut, between turret and bearing housings. The hardened friction starter and driver have been so constructed that at any speed proper synchronization of the driver teeth is accomplished without clashing.

It goes without saying that our fighting men must have the finest possible quality materials home industry can produce. So, although the stock of quality raw materials from which Wrigley's Spearmint chewing gum is made is growing steadily smaller, they are still maintaining pre-war standards. However, they can now make only a portion of their former output, so all of this limited production is going to our fighting men and women overseas only . . . where it is an "on-duty" need.

You can get complete information from Chicago Drillet Corporation, 919 N. Michigan Ave., Chicago 11, Ill.



Quick and positive indexing assured by pointers on index disc



Quadrill assembly complete ready for attachment to drill press

Y-141

Hand Protective Cream

A new water-resisting hand protective cream for workers whose jobs bring them into contact with water-soluble cutting oils, dilute acids, alkalies and other water-chemical mixtures, is announced by G. W. Sherin, chemical specialties expert of the Du Pont Company's Finishes Division.

Known as "Pro-Tek No. 2" hand-protective cream, it is a companion to the original "Pro-Tek," a greaseless product which protects against paints, lacquers, grime, grease and insoluble cutting oils. The new cream is intended for operations where water is present and the standard water-soluble "Pro-Tek" unsuitable.

An important advantage of "Pro-Tek No. 2" is that it protects against a number of chemicals, and thus eliminates the necessity of separate creams for each particular need.

The new cream is applied to the hands and arms before starting work. It forms a flexible, slightly greasy film which acts like an invisible glove. One application lasts from 3 to 4 hours and may be removed by using an industrial hand cleanser or washing in hot water with a mild soap. It has been pre-tested in several large factories with the cooperation of safety engineers and plant hygienists. Neutral in reaction and non-irritating, it contains a high percentage of lanolin, which closely resembles the natural oils of the skin. The new product is intended primarily for use in industry.

Nozzles

Currently there is much interest in flame priming and descaling, the modern method to remove rust scales from steel plate and prepare it for painting.

The new Victor Standard Descaling Attachment, illustrated, is easily attachable onto any standard Victor welding torch butt. It can also be furnished with torch butt to those who are not owners of Victor equipment.

This particular flame priming and descaling nozzle has many advantages:

(1) It is provided with an unusually well-designed spiral mixer and gas proportioner to handle with greater efficiency the larger gas volumes required for these operations.

(2) This mixing device virtually assures freedom from back-fire or flash-back.

(3) In order to keep pre-mixed gases below ignition temperatures, even within the proximity of the ribbon flame and deflected heat, an airadiator aluminum cooling section is incorporated at the nozzle head.

For further details communicate with Victor Equipment Co., Dept MF, 844-54 Folsom St., San Francisco, Cal.

New Book

Copper and Copper-Base Alloys. By R. A. Wilkins and E. S. Bunn. Published by McGraw-Hill Book Co., 330 West 42nd St., New York, N. Y. 1943. 355 pp. Price: $5.00. This book contains information dealing mostly with the physical properties of copper and its alloys, such as tensile strength, elongation, hardness, annealing temperatures, etc. Portions, however, contain descriptive matter on the many alloys of copper and this will clarify a question often asked by the plater and seldom answered, namely, what is this metal? For example, if a part to be nickel plated is made of brass with a deep drilled hole, it is possible that the brass has been "leaded" for ease of machining, often with as high as 3.75 per cent lead. This fact can be considered when finishing difficulties arise. Similarly, the less common alloys, such as beryllium copper, the cupro-nickels, the silicon bronzes and the aluminum bronzes, can be studied from information in this book to determine the most likely successful finishing procedures.

Business Items

Ralph W. Hisey

Ralph W. Hisey, vice-president of *The Osborn Manufacturing Company*, has been promoted to the position of vice-president in charge of all manufacturing and engineering of both the brush and machine divisions of the company, it is announced.

Mr. Hisey has been associated with the company for over thirty years and has been vice-president since January, 1935.

Hugh M. Little

Hugh M. Little has been appointed works manager of both divisions. He was associated with the Ohio Crankshaft Company and the American Bantam Car Company before joining Osborn.

Maurice S. Green, formerly of the National City Bank of New York, has been appointed comptroller of the *Glyco Products Co., Inc.* of Brooklyn, N. Y., specialists in the development and manufacture of industrial chemicals. Mr. Green brings to the company long experiences as an accountant and executive. In his new position, he will be in charge of the finances of the company, and will assist the management generally in the development of the business.

Pennsylvania Salt Manufacturing Company announces the organization of an Export Department at the company's main office at 1000 Widener Building, Philadelphia. *Mr. John H. S. Barr* has been appointed manager. The formation of an Export Department is a result of the company's study over the past year of the possibilities for post-war business in all Latin American countries including Cuba, Haiti, Jamaica, and Puerto Rico. Mr. Barr made an extended visit to Brazil and other important Latin American countries last year for the purpose of investigating the possibilities for future business in the heavy and specialized chemicals produced by the company. In the United States the Pennsylvania Salt Manufacturing Company is a manufacturer of chemicals for agriculture, water and sewage, metal industries, ceramics, glass, oil refining, pulp and paper, textiles, leathers, laundry and dry cleaning, aviation gasoline manufacture, and many other industries.

Mr. Barr has been identified with the company for 15 years in technical and sales capacities.

Dr. William A. LaLande, Jr., formerly Director of Research of Attapulgus Clay Company, has joined the Research and Development Department of *Pennsylvania Salt Manufacturing Company* as Director of Research, according to announcement by *Dr. S. C. Ogburn, Jr.*, Manager of Research and and Development. Dr. LaLande will have immediate charge of the Research Division.

After nearly four years with the services in the States, in New Guinea, and Australia, *Capt. "Jimmy" B. Willis* returns to the Technical Laboratories of the *Pemco Corporation* in Baltimore.

Shortly after his graduation from the Ohio State University, 1939, in Ceramic Engineering, Capt. Willis came to Pemco as an active member of their research staff in their Laboratories. In December of 1940 he was called into active service with a rating of Second Lieutenant. Stationed at Ft. Belvoir, Virginia, from December, 1940 to June, 1942, he joined the Amphibian Engineers. Was made commander of a company and was sent overseas to New Guinea. Because of illness he was evacuated to Australia and then returned to the United States. In August of this year he will be retired from active service and at present is on terminal leave.

At Pemco Capt. Willis is engaged in a highly specialized analytical development and in the near future hopes to release a paper on his findings.

L. F. Weyand, general sales manager of the *Minnesota Mining & Manufacturing Company's* Adhesive and Coatings Division since 1936, has been promoted to general manager, a new post entailing responsibility for all production, sales, research and laboratory activities of that division.

L. F. Weyand

Mr. Weyand has been associated with the Minnesota Mining & Manufacturing Company for 28 years. Under his leadership the Adhesive and Coatings Division has become widely diversified, both as to the kinds of adhesives produced and the classes of trade served, and has grown into one of the important divisions of the 3-M organization.

Mr. Weyand will continue to maintain headquarters at the 3-M factory in Detroit where all adhesive and coating activities of the company have been centered for eight years. The company's executive headquarters are in St. Paul, Minn.

The *Du-Lite Chemical Corporation* of Middletown, Connecticut, has established a fellowship in the Chemical Engineering Department of the College of Applied Science, Syracuse University, for the purpose of conducting research on metal finishing. The research work will be under the direction of *Dr. N. F. Murphy*. The recipient of the fellowship is *Michael A. Streicher*, 7 Chestnut Street, Orange, N. J., who is pursuing work toward his Masters Degree in Chemical Engineering.

Pursuing a policy of post-war expansion in "Chemifinishing" of metals, the Du-Lite Corporation plans to develop new finishes for metals and to study the requirements for the application of finishes.

Mr. Streicher graduated from Rensselaer Polytechnic Institute in 1943, where he received the degree of Bachelor of Chemical Engineering. Since January, 1944, he has been studying in the Graduate School at Syracuse University where he hold a scholarship in Chemical Engineering.

Mr. E. B. Lewis, General Manager of the Du-Lite Corporation, in discussing the foundation of this fellowship, says, "Syracuse University, located in the center of the metal processing industries of Central New York, should be an ideal institution for carrying out industrial research in the field of metal finishing."

Charles L. Saunders

Charles L. Saunders, former vice-president of *Minneapolis-Honeywell Regulator Co.*, has resigned as branch chief of the WPB Office of Civilian Requirements, to become vice-president of *Wheelco Instruments Company*, Chicago. Saunders joined WPB in March, 1942, to organize an instrument branch to correlate manufacturing problems of the instrument industry with war production.

A graduate electrical engineer of the University of Virginia, he previously served as sales correspondent and district manager of Brown Instrument in Birmingham, Houston, Pittsburgh and Chicago. With acquisition of the Brown company by Minneapolis-Honeywell in 1935, Saunders was appointed Chicago regional sales manager, and two years later became resident vice-president of the company.

Saunders is recognized for valuable contributions to the science of instrumentation in many industries, and has specialized in oil refining processes, the ceramic industry and the metal industries. He is also well versed in application of instruments to industrial processes involving measurement and control of temperature, pressure, flow, combustion and speed.

Rheem Research Products, Inc., of Baltimore, Md., has announced the acquisition of a West Coast research and manufacturing branch, and the appointment of three new distributors. Currently, the chief product of Rheem Research is "*Iridite*," a treatment in several colors, for corrosion-proofing zinc and cadmium surfaces.

The executive offices of the West Coast plant and laboratory are at 714 W. Olympic Blvd., Los Angeles 15, California. The new distributors are: *MacDermid, Inc.*, Waterburg 88, Connecticut, *Wagner Brothers*, Detroit 2, Michigan, and *J. C. Miller*, Grand Rapids 4, Michigan. The company also maintains a branch office at 20 E. Jackson Boulevard, Chicago, Ill.

On Wed. Aug. 9, 1944, at Treasure Island Chapel, San Francisco, Warrant Officer Al Baker, U. S. N. was wed to Miss Evelyn Bramy of San Francisco.

Al's two sisters, Mrs. Ann Baker Love and Mrs. Joseph Barron were present at

the ceremony. The wedding reception took place at the Mark Hopkins Hotel.

The bridegroom, as a civilian, was connected with M. E. Baker Co., 143 Sidney St., Cambridge, Mass.

Lt. Palmer H. Langdon

Lt. Palmer H. Langdon, Assistant Editor of *Metal Finishing*, at present on leave with the Armed Forces, has been promoted to the rank of First Lieutenant, his citation "Conspicuous ability in combat with the enemy." Lt. Langdon has been with the 3rd Engineer Special Brigade since July 31st, 1942, and has been in S.W.P.A. since December, 1943.

Major William M. Wiarda

Major William M. Wiarda, husband of *Metal Finishing's* advertising manager, Joan Trumbour Wiarda was promoted to Major on July 26th. Major Wiarda was injured on July 19th and is still confined to the base hospital. Lt. Palmer Langdon has visited "Bill" in New Guinea several times during the past few months.

Manufacturers' Literature

Two Cleaning Booklets

A 16-page booklet which emphasizes fundamental practices for the economical use of degreasing solvents in metal cleaning departments of industrial plants and describes typical designs of degreasers has just been published by *Detrex Corporation*, Dept. MF, Detroit 27, Michigan, under the title of "*Solvent Degreasing and Effective Methods of Conserving Chlorinated Solvents*".

"*Detrex Triad Alkali Cleaners*," an 8-page booklet describes in detail alkali and emulsion cleaning compounds developed by Detrex for all types of metal cleaning jobs. It also covers the many uses and applications of alkali cleaning materials in aircraft, automotive, railroad, metal fabricating and other industries.

Fan Cooled Gear Units

Catalog No. 300 issued by *The Cleveland Worm & Gear Company*, Dept. MF, Cleveland, Ohio, is a comprehensive exposition of Speedaire Fan Cooled Worm Gear Reduction Units. The Speedaire principle is fully detailed by means of cutaway photographs, charts, diagrams and engineering tables.

With Speedaire, heat generated during the operation of the unit passes through the oil bath to the deeply-finned wall of the reservoir. An exhaust fan on the coupling end draws a continuous stream of air at high velocity between the double walls that form the lower half of the unit, completely scouring the surface and providing an effectual transfer of heat.

The catalog states that as the result of this improved cooling, smaller sizes of Speedaire units may be applied to a given installation than have been possible heretofore. In some cases it is claimed that the new units offer as much as twice the capacity of standard worm gear units of equal frame size when operated with 1750 r.p.m. motors. Following the explanatory and descriptive material which comprises the first portion of the book, the design engineer will find carefully detailed instructions for planning installations of Speedaire units, with illustrative examples. Supplementing these instructions are rating tables for six sizes ranging from 4¾" to 12" centers. Full information is also provided on dimensions and shipping weights.

Wick Feed Oilers

New Bulletin No. 27-A illustrates and describes a modernized line of Wick Feed Oilers supplying visible, automatic lubrication to solid, wick and waste-packed bearings. Helpful hints on how to eliminate needless shutdowns for hand-oiling, end bearing failures, splattering of oil, etc., are given. The plastic reservoir has reinforced ribs for extra strength. Oiler is 50% lighter in weight and has four times the capacity of ordinary oilers for the same space utilized. Available in 1, 2, and 4 oz. capacities. Write for your free copy. *Trico Fuse Mfg. Co.*, Dept. MF, 2948 No. 5th Street, Milwaukee 12, Wis.

Associations and Societies

AMERICAN SOCIETY FOR METALS

Some 300 manufacturers and organizations serving the metal industry have broken a 26-year record for advance reservations of display space in the *War Conference Displays* and *National Metal Congress*. Scheduled for the week of October 16 in Cleveland's Public Hall, the Metal Congress is still months away but already larger than ever before.

"These heavy advance reservations reflect the cooperative spirit of the metal industry and its desire to come to grips with the problems that lie ahead", said *W. H. Eisenman*, managing director of the Congress and national secretary of the American Society for Metals.

The Metal Congress is sponsored by the American Society for Metals in cooperation with the *American Welding Society*, the *Iron and Steel* and *Institute of Metals* divisions of the *American Institute of Mining and Metallurgical Engineers*, the *American Industrial Radium and X-Ray Society* and the *Society for Experimental Stress Analysis*.

Technical sessions will be held each morning, afternoon and evening during the Congress with nearly a thousand metal experts collaborating in the preparation and presentation of some 150 lectures. In addition to the technical reports on research developments of the past year, the American Society for Metals will present a series of practical panel-type meetings each afternoon and evening, with the exception of Thursday evening when the annual dinner will be held.

SOCIETY OF CHEMICAL INDUSTRY

The *American Section* of the *Society of Chemical Industry* announces the election of *Dr. Norman A. Shepard*, Chemical Director of the American Cyanamid Company, as their chairman and *Mr. Frank J. Curtis*, Vice-President of Monsanto Chemical Company as vice-chairman, to serve until July, 1945.

Cyril S. Kimball and *J. W. H. Randall* were re-elected Honorary Secretary and Honorary Treasurer, respectively. The following were elected as members of the Executive Committee: *J. L. Bennett, P. K. Frolich, F. D. Snell, W. B. Wiegand* and *E. C. Williams*.

AMERICAN COORDINATING COMMITTEE ON CORROSION

At the sixth annual meeting of the *American Coordinating Committee on Corrosion* held June 29, 1944, at the Waldorf-Astoria Hotel, New York, *Frank L. LaQue*, of the Development and Research Division of the International Nickel Company, was elected Chairman for the current year. *Mr. George H. Young*, of the Mellon Institute of Industrial Research, was named Vice-Chairman, and *George W. Seagren*, also of Mellon Institute, was elected Secretary-Treasurer. The Committee headquarters are located at 4400 Fifth Avenue, Pittsburgh, Pa.

The Coordinating Committee was organized in 1938 to serve as a clearing house and coordinating agency for information on American experience and American work in progress in the field of corrosion and corrosion prevention, and to act as an agency for the exchange of corrosion information and experience with similar foreign agencies such as the corrosion committee of the British Iron and Steel Institute. It also serves as a medium through which individual workers may make contact with other investigators here and abroad in specific fields of corrosion work.

The Committee is at present composed of official delegates from the following societies: American Foundrymen's Association, American Gas Association, American Institute of Chemical Engineers, American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Society for Metals, American Society of Refrigerating Engineers, American Society for Testing Materials, American Water Works Association, Armour Research Foundation, Battelle Memorial Institute, The Electrochemical Society, Mellon Institute of Industrial Research, National Bureau of Standards, National District Heating Association, National Research Council, Society of Automotive Engineers.

In addition to these organizations, the Committee lists approximately five hundred individuals and companies active in the field of corrosion and corrosion prevention, classified into two hundred and ten specialized branches of the field.

Six sub-committees have been activated during the past several years as follows: Sub-committee 1: To coordinate studies of under-water paints; Sub-committee 2: To cooperate with the British Admiralty Marine Corrosion Committee; Sub-committee 3: To examine and approve applications for grants-in-aid from the research fund offered by the American Society for Metals for the support of fundamental research on corrosion; Sub-committee 4: To standardize corrosion test materials; Sub-committee 5: To standardize corrosion terms and symbols; Sub-committee 6: To advise the Navy's Bureau of Ships on special problems upon request.

News from California
By FRED A. HERR

A recent visitor to Southern California was *Paul F. Voigt*, manager of the stainless steel division, *Carnegie-Illinois Steel Corp.*, Pittsburgh, Pa., who made a survey of present and post-war potentialities of the stainless steel situation on the West Coast.

Displays of war and post-war metal products, raw metal materials and production techniques were one of the features programmed for the *Southern California Industrial and Post-war Exposition* to be held at Pan Pacific Auditorium, Los Angeles, September 2 to 9.

Delbert G. Luper has been named general superintendent of *Repcal Brass Co.*, Los Angeles. Mr. Luper served as foundry superintendent during the past 1½ years, and prior to joining the Repcal Co. early in '43 had been superintendent of the Gray-Bohn heat control foundry.

E. O. Locher, secretary-treasurer, *Airborne Manufacturing and Supply Corp.*, Los Angeles, has been named general manager, taking over part of the duties of President *Carl Herring*, who had been serving both as president and general manager.

Aircraft Accessories Corp., Burbank, Calif., has taken over the power brake division of *Bendix Corp.*, Emeryville, Calif., and is moving plant equipment from Emeryville to Burbank where it is being incorporated with the power controls division.

A survey conducted by the *Merchants & Manufacturers Association* of Los Angeles has disclosed that it costs industry an average of $188 every time a worker quits his job.

With the average turnover determined to be at the rate of 11% a month, total costs of breaking in new personnel in the Los Angeles area, the report showed, is $110,000,000 a year.

The figures are based on estimates received by the association from employers in the aircraft, construction, metal working and processing and other fields, employing from 50 to 25,000 workers each. Included were metal finishing and electroplating plants employing from 50 to 300 workers.

Of the $188 average turnover cost, it was found there was a $14 loss after the employee decided to quit. This was represented by slower pace of work, exit interviews, badge surrendering, tool checks and other routine functions.

About $65 is spent in advertising for, interviewing, testing and establishing each replacement in the job. During the training period, it is estimated, the new employee draws $218 average in pay, but of this, the report indicated, probably half is wasted in spoilage and other incidental loss of efficiency.

Obituaries

Dr. Frank J. Tone

Dr. Frank J. Tone, pioneer in developing
asives and refractories and noted for his
tributions to physical chemistry, died
ently at his home after a long illness. His
was 75.

Father of Franchot Tone, stage and mo-
n picture actor, he was chairman of the
rd of directors of the *Carborundum Com-*
y, abrasives manufacturer. He retired
president of the concern April 22, 1942,
r serving in the position since 1919.

Dr. Tone originated the first commercial
cess for production of silicon metal. He
discovered the silicon carbide heating
ments, fibrous silicon oxycarbide and
con monoxide. He held nearly 150 patents.

A former president of the *American Elec-*
chemical Society, he received in 1938 the
rkin Medal of the American section of
Society of Chemical Industry for his
luable work in applied chemistry, in-
ding the development of abrasives and
ractories." Dr. Tone also received the
ward Goodrich Acheson Medal, conferred by the American Electrochemical Society in 1935.

He joined Carborundum in 1895 as a chemist, a few years after his graduation from Cornell University. He was born in Bergen, N. Y.

Dr. Tone leaves a widow, the former Gertrude Franchot, whom he married in 1900, and another son, Frank J. Tone Jr., a vice president of Carborundum.

Harry Scott Wherrett

Harry Scott Wherrett, 68, chairman of the board of directors of the *Pittsburgh Plate Glass Company*, associated with the organization for more than 53 years, the longest service record of any employee, died on August 13 after a brief illness. He had long been active in business, civic, and philanthropic affairs of the city of Pittsburgh.

He was born October 24, 1876, in Connorsville, Indiana, the son of William Henry and Bell Jane (Scott) Wherrett. His father, a native of Kentucky, was for many years a merchant, banker, and dealer in real estate. Both his parents were of Scotch ancestry.

Mr. Wherrett received his early education in the public schools of Connorsville and later attended the Kokomo, Indiana, high school. Much has been written about his phenomenal rise from office boy to chairman of the board of directors, his many honors, his business connections, and other affiliations.

In 1891 at the age of 15 he secured employment as office boy with the Diamond Plate Glass Company, which in 1895 became a part of the Pittsburgh Plate Glass Company. A year later Mr. Wherrett was transferred to the company's general office in the city of Pittsburgh as a clerk in the sales department.

He was promoted to the position of manager of plate glass sales in 1905, to chairman of the commercial department in 1916, to vice-president in 1919, and to president of the company in 1928. In 1941 he was named vice-chairman of the board of directors, and in January, 1944, became chairman.

He is survived by his wife, Mrs. Mary A. Wherrett, and a sister, Miss Blanche Wherrett.

Edgar Hiel Bristol

Mr. Edgar H. Bristol, President of *The Foxboro Company*, of Foxboro, Mass., and one of its founders, died unexpectedly of a heart attack, on July 24, at his summer home at Falmouth Heights, Mass.

Mr. Bristol was born in Naugatuck, Conn., March 7, 1871. He had unusual mechanical skill, and after completing his high school education he found employment as a machinist, later becoming a tool-maker and subsequently production manager of the instrument company of which his father was president. With his brother, Bennet B. Bristol, he withdrew in 1908 to organize the Industrial Instrument Company which, on January 1, 1914, became The Foxboro Company. Mr. Bristol maintained an active participation in the company's affairs, serving as its president throughout its history. He was also the president of the Foxboro National Bank.

More than forty patents were recorded to his credit, some of them so basic in character as to establish new principles of instrument design and operation. The helical spring, which is the measuring element in temperature and pressure recorders, is an example of his inventive genius.

He is survived by his widow, a son, Benjamin H. Bristol, four daughters and sixteen grandchildren.

SEPTEMBER, 1944

ORGANIC FINISHING

SECTION OF METAL FINISHING

LACQUERING • ENAMELING • JAPANNING • PAINTING

What do You want? ASKS THE A.G.M.

ZAPON DIVISION

CABLE ADDRESS "ZAPONRICH"

ATLAS POWDER COMPANY
STAMFORD · CONNECTICUT

September 1, 1944

To Our Customers:

War production goes on top speed, but with the imminent collapse of Germany, we will have to apply our efforts to reconversion. We must guide our research to meet your problems.

We have accumulated valuable experience in making war product finishes. We have made and continue to make studies of new raw materials for product finishes. We have developed new methods of formulation, processing, etc.

The course of our work, however, must be guided by what you will need as the finish on your product after military cutbacks take effect. I have had frank answers from many manufacturers to my question, "What Do You Consider the Most Important Post-War Finishing Problem?" As a result of these answers, we have already formulated and tested a number of new finishing materials.

It may be that by telling us what you need, you can tap this increasing knowledge, particularly on your own operation, which may help point out the direction for our further developments.

Other manufacturers are now working with us. Why don't you? I'd like to put you in touch with a qualified member of our staff.

Very truly yours,

ZAPON DIVISION
ATLAS POWDER COMPANY

Ed. H. Bucy.

Ed. H. Bucy
Assistant General Manager

ZAPON DIVISION ATLAS POWDER COMPANY
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Publication Office
11 West 42nd St.,
New York 18, N. Y.

ORGANIC FINISHING

SECTION OF METAL FINISHING
SEPTEMBER, 1944

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Cover Photograph

nd abrasion test for organic finishes. measured amount of sand from the pper is allowed to strike the test nel placed at a 45° angle at the tom of the tube. *Photograph courtesy Servel, Inc., Evansville, Ind.*

Aluminum Finishes

The easing of the aluminum metal situation indicates that larger quantities of aluminum powder will be reaching the finishing industry. Aluminum powder is one finishing material ingredient for which there is no good substitute and its lack has created or complicated many finishing problems.

Availability of aluminum powder, however, will not return us to pre-war aluminum finishes. While there may be aluminum powder to be had, the demand for vehicles, especially those of the quality developed before the war, will far exceed the supply due to shortages of resins, solvents and similar ingredients necessary to obtain good leafing, stability and other characteristics of a good vehicle for aluminum. Aluminum vehicles are specially formulated materials and not any ordinary clear lacquer, varnish or synthetic will do. The lack of a single ingredient can make the difference between an excellent vehicle and a poor one.

Of course, even good aluminum vehicles can be abused. To obtain the best from a vehicle it must be properly handled. For example, the correct proportions of aluminum and vehicle must be determined by test for any application. Some vehicles may require more or less aluminum than others depending on factors such as solids content of the vehicle, method of application, etc. The blanket use of a half-pound or one pound or two of aluminum per gallon of vehicle regardless of these factors is absolutely wrong.

The same applies to the thickness of the applied film. The optimum film thickness of the aluminum finish must be carefully determined and maintained in production as closely as conditions will allow.

Other requisites for successful aluminum finishing are well known. The proportions of aluminum and vehicle should be measured out, not guessed at. The vehicle should be added to the aluminum in small amounts, stirring the mix to smoothness after each addition. Only enough mix for one day's use should be made. Any excess mixed material should be stored in closed containers and used by blending it into fresh mix in small quantities. After mixing, the material should be agitated only enough to prevent settling.

Following these tested and proven procedures is the key to obtaining the best performance of aluminum finishes at the lowest cost.

L. H. LANGDON, *Publisher* • WILLOUGHBY G. SHEANE, *Associate Editor* • T. A. TRUMBOUR, *Business Manager*

NEWS FROM WASHINGTON—

By George W. Grupp
METAL FINISHING's Washington Correspondent

Alcohol Plants Close In Eire Because of a shortage of potatoes, the Department of Commerce reports, four industrial alcohol plants in Eire were recently forced to suspend operations.

Alcohol and Acetate Shortage Alcohol and butyl acetate supplies allocated for protective coatings were greatly reduced in August when compared with other months of this year. In fact a shortage of butyl alcohol is expected to continue this winter. Increased military requirements indicate that ethyl and isopropyl acetate will be equally as scarce for civilian consumption.

Alkyd Resins Restrictions Eased Direction No. 3 to General Preference Order M-139 was issued on July 18, 1944 to facilitate the obtaining of emergency allotments of alkyd phthalic resins to meet small emergency orders for military end uses. Emergency allotments are limited to a "maximum of 5 per cent of the average monthly consumption of alkyd resins by the applicant during the previous three months."

Blue Pigments Under Order M-300 Due to increasing war demands ultramarine blue pigments have been made subject to Allocation Order M-300 since August 1, 1944. However, one person may get 25 pounds per month with the use of a certificate. Those desiring a larger monthly amount must make application on WPB-3442.

Three Chemicals Removed from Allocation Increased production facilities and improved imports made it possible on August 8, 1944 for the War Production Board to remove the allocation controls, under Order M-300, on polyfiber, propylene glycol and diethylene glycol. At the same time the small order exemption for pine tar, previously five gallons per month, has been increased to 54 gallons per month. Pine tar is used as a protective coating on winches.

Fish Oils Banned The Department of Commerce reports that fish oils will no longer be permitted in the manufacture of paint and putty in the United Kingdom. Linseed oil must be used instead.

Gum Naval Stores Committee Appointed The Office of Price Administration on July 31, 1944 appointed a Gum Naval Stores Industry Advisory Committee which consists of A. L. Brogden, Turpentine and Rosin Factors, Inc., Jacksonville, Fla.; T. J. Taylor, Jr., Taylor and Lowenstein Company, Mobile, Ala.; M. L. Rue, Filtered Rosin Company, Brunswick, Ga.; E. W. Colledge, Nelio Rosin Processing Corporation, Jacksonville, Fla.; J. C. Nash, Columbia Naval Stores Company, Savannah, Ga.; H. Langdale, American Turpentine Farmers' Association, Valdosta, Ga.; L. W. Brannon, Jr., Elberta Turpentine Company, Foley, Ala.; W. J. Boynton, American Turpentine Farmers' Association, Tallahassee, Fla.; R. M. Newton, Newton Naval Stores Company, Wiggins, Miss.; J. L. Gillis, Jr., Sopertonk, Ga.; Harry Lurton, Peninsular-Lurton Company, Pensacola, Fla.; Walter B. Dyal, E. C. Dyal & Company, Helena, Ga.; W. Capers Rice, Vidalia, Ga.; G. W. Hall, G. W. Hall Naval Stores Company, Melrose, Fla.

MRO Regulation Eased According to Interpretation No. 14 to CMP Regulation No. 5, issued on July 22, 1944, plants engaged in more than one activity may use the preference rating assigned under Controlled Materials Plan Regulation No. 5 to the principal part of their business to obtain maintenance, repair and operating supplies for all their activities.

Naphthenic Acid Demand Increasing The members of the Naphthenic Acid and Naphthenates Industry Advisory Committee were told by WPB officials on August 15, 1944 that the demand for naphthenic acid will increase sharply in September to meet military requirements. It is their opinion that production will have to be stepped up or some of the present civilian uses will have to be eliminated. The principal non-military uses are as driers for paints and coatings.

National Paint, Varnish and Lacquer Association Cancels Annual Convention The National Paint, Varnish and Lacquer Association, Inc. has cancelled its convention planned for this forthcoming October to comply with the request of the Office of Defense Transportation that non-war connected conventions and meetings necessitating rail or bus travel be given up to lighten the burden on the country's transportation facilities.

Naval Stores Production In Spain The La Union Resiners Espanola, S. A. of Spain, capitalized at 125,000,000 pesetas, exploited a total of 7,500,000 pine trees in 1943. The 1943 production of turpentine amounted to 3,200 tons as compared with 2,700 tons in 1942, and the colophony (rosin) production increased from 9,680 tons in 1942 to 11,000 tons in 1943.

Oleyl Alcohol Under M-300 Schedule 33 to General Allocation Order M-300 was amended on July 24, 1944 to include oleyl alcohol (normal octadecenol) in this order.

Protective Coatings Oil Order Clarified Protective Coatings Conservation Order M-332 was amended on July 21, 1944 to clarify the wording on deliveries. It now reads: "Deliveries by any wholesaler of raw linseed oil which on July 1, 1943 and at the time of delivery, was packaged in unopened drums or containers having a capacity of more than 8 gallons but not more than 55 gallons and was on both such dates either owned by him or in his possession on consignment from a crusher or processor. The total quantity of raw linseed oil delivered pursuant to this paragraph by any wholesaler of raw linseed oil shall not exceed 1375 gallons."

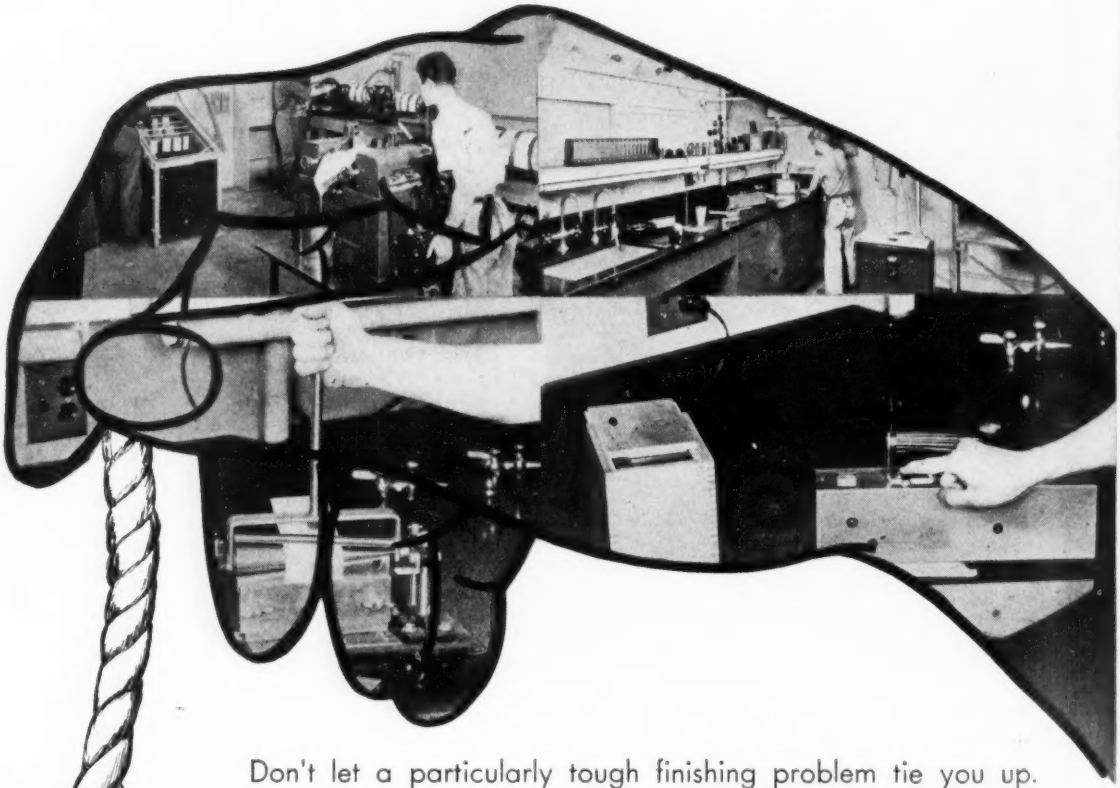
Rosin and Turpentine Production in India During the first quarter of 1944 the rosin production in India amounted to 1,887 long tons, and the amount of turpentine produced amounted to 415 long tons.

Shellac Under PR #3 Direction 5 to Priorities Regulation No. 3 was amended on August 1, 1944 for the purpose of including under PR #3 such chemicals as carbon dioxide (gaseous, liquid, solid), and shellac (bleached only).

Synthetic Paint and Varnish Industry Progresses in Sweden According to Department of Commerce reports casein is now being used as a base for oil paints in Sweden. In fact, it is reported that synthetic paints and varnishes have made considerable progress in Sweden since the beginning of World War II.

Tung Nut Crop In Brazil It is officially reported that the current crop of tung nuts in the States of Sao Paulo and Parana, Brazil will amount to 500,000 kilograms from which about 75 tons of good quality of tung oil will be obtained.

KNOTTY FINISHING PROBLEMS UNTIED HERE...



Don't let a particularly tough finishing problem tie you up. ALAKA is geared for speed and equipped with what it takes ... both with the "know-how" of skilled technicians and with unusual, up-to-the-minute equipment in air-conditioned, temperature-controlled laboratories.

Racing against time, ALAKA is custom-tailoring fine industrial finishes that meet and exceed the toughest of government specifications ... that overcome "impossibilities". Take your problem to ALAKA and you will not have to go further.

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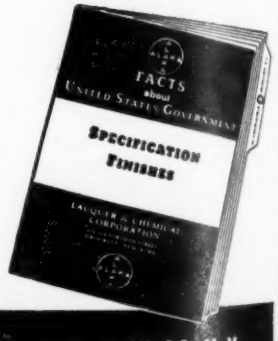

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Enameling and Lacquering Nameplates

By A. A. McMANN

Vice President, American Emblem Co., Inc., Utica, N. Y.

Many appliance manufacturers are planning or have completed their post-war designs. To them this article will be timely and interesting. To those manufacturers who have need for nameplates now, there are available nameplates made from steel which can be decorated with low-baked enamels, described in the latter part of the article. Gilding metal, for use with hard-fired vitreous enamels, will probably not be available until after the war.—Ed.

WHY do most appliance manufacturers and design engineers give critical attention and care to the selection of nameplate designs and to the decorative colors of those plates? Because, through the different media of advertising—radio, newspapers, magazines and direct mail—people have become acutely name conscious. People no longer buy just a refrigerator or washing machine or automobile. They buy to a great extent by brand name.

In consequence, people have this almost universal tendency—in the first appraisal of any appliance, the eye is directed first to the maker's name. This impelling bias to a name product is the fruition of every dollar spent by manufacturers for developing for their brands a reputation which leads the consumer, when in the market, to give their products serious consideration. The nameplate of an appliance has become the manufacturer's signature to his product—his way of saying proudly "This is my product."

On the nameplate, therefore, rests a burden of responsibility. It must do more than merely identify. The successful nameplate must have the following qualities:

1. It must reflect the maker's pride in his products. This is accomplished by effective nameplate design, plated finishes and either low-baked or hard-fired enamel colors.

2. The beauty of a nameplate must remain constant during the life of an appliance. The advertising and prestige value of a nameplate depends mainly on its capacity for resisting physical and chemical influences such as extreme temperatures, the elements of weather and cleaning and polishing agents. Deteriorated nameplates impair, psychologically, the brand reputation.

3. The nameplate must create confidence in an appliance and thereby help promote sales.

Vitreous Enamels

How are striking and beautiful colors achieved in nameplates? What degree of permanence do they possess?

For gleaming brilliance, permanency and lustre, nothing surpasses hard-fired jeweler's French vitreous enamels. They are practically fade-proof, indestructible (unless severely abused) and impervious to extreme temperatures, elements of weather and cleaning and polishing agents. Jeweler's vitreous enamelled nameplates always present a consistent beauty of shining color.

The art of enameling is of the greatest antiquity. The ancient Persians and Arabians practiced it upon earthenware and porcelain. Articles of pottery enamelled in colors have been found amongst the ruins of ancient Thebes and in many of the cities of Egypt are buildings constructed of enamelled bricks taken from the ruins of elder cities.

Most interesting is the knowledge that the materials used by the ancients are practically the same as those used now. However, modern scientific equipment has replaced the old mastercrafter's tedious and costly effort and costs have come down, with the result that enamelled nameplates are available at prices that are moderate.

What are vitreous enamels? The basis of all enamels is colorless silicate or glass which can be liquified and blended by heat and to which the desired color and the required degree of opaqueness or transparency are imparted by mixtures of metallic oxides. The molten mass, after cooling, is reduced to a fine powder. Nameplate manufacturers usually purchase enamels in powder form from enamel producers. The enamel powders are already mixed for opaque or transparent effects and for the different shades of color desired.

Metal Preparation

The material best suited for the production of stamped and enamelled nameplates is "gilding metal," composed of 95% copper and 5% zinc.

Enamel will not adhere permanently to any but a surface of chemically clean metal. Therefore, it is of the utmost importance that the nameplates, preparatory to enameling, be free from grease dirt and oxides. This is accomplished as follows:

After the nameplates are blanked and die struck, they are heated to a redness in an annealing furnace. This operation burns off from the surface impurities acquired in working the stock. The annealing process forms scale and oxides on the nameplates which is completely removed by immersing the nameplates in a bath of thirteen parts water and one part nitric acid. The plates are then rinsed thoroughly with clean running water until all trace of acid is removed.

After the pickling or cleaning operation, bright dipping is desirable. A bright dip is composed of one gallon of nitric acid, one gallon of sulphuric acid and four ounces of muriatic acid. Finally, the plates are heated to remove any remaining moisture.

Application of Enamels

The nameplates are now ready for the enamels. To impart the necessary fluidity to the enamel, it must be reduced to a thick cream by the addition of distilled water. It must be stirred until perfectly homogeneous and free from lumps. If the water contains organic impurities, these will be retained by the enamel materials and will be carbonized in the subsequent process of fusion. This may explain why it is sometimes difficult to produce perfectly white or really handsome-colored enamels in delicate shades.

The enamel is applied as follows: First, the enamel is stirred.

Then, by means of a sieve, tweezers, spatula or stencil, it is distributed uniformly on the surface of the nameplate. Long practice enables highly skilled enamellers to judge precisely the quantity required to coat a given article, so that no excess remains to be drained off.

The nameplates are then dried before firing in order to expel the final traces of moisture from the enamel. Uniformity in drying is of special importance in ensuring the success of the enameling operation since, if the nameplates are placed in the firing furnace before they are thoroughly dry, the moisture causes pitting and chipping.

Now comes the first firing operation. To fuse the enamel mass, the nameplates are placed in electric enamel fusing furnaces which are heated to 1400°-1500° F. Skilled operators are in constant attendance to judge when the plates have been fired to the proper degree and are ready for removal.

After the first firing, if additional colors are to be inlaid in the nameplates, the plates are again pickled and bright dipped. Failure to render the plates chemically clean again results in poor adhesion of the enamels to the surface, with the subsequent deterioration.

The second and third firing operations, when necessary for additional colors, are performed in the same manner as the first. After each firing stage, the nameplates are inspected for low spots in enamels which, when they occur, are patched and fired.

When the plates are completed, any excess enamel is removed by grinding the enamelled surface against carborundum wheels. They are then washed in a dilute solution of hydrofluric acid to remove any foreign substance like dirt or abrasive that might be contained in the pores of the enamel. The plates are then dried to eliminate moisture.

After the foregoing operations, the enamelled surfaces have a dull appearance. To restore the gloss of the enamel colors, the nameplates undergo a final firing operation. Then comes the task of giving the enamels their true brilliant lustre. This is accomplished by polishing the enamelled surfaces by using finely ground pumice stone mixed with water and a rock-hard felt wheel. After several applications on the wheel, the true gleaming colors of the beautiful enamels are achieved.

Low-Baked Enamels

Enamel or lacquer, through the developments of recent years, is being increasingly used for the decoration of nameplates. What are the advantages of lacquer colors? They cost less than vitreous enamels to apply. Also, almost any color can be reproduced. Lacquer enamels will adhere to most metals, whereas, in the production of nameplates, vitreous enamels are used chiefly on gilding metal.

The wearing quality of lacquer enamels is excellent but they are not as resistant to physical and chemical influences as are h fired vitreous enamels.

Section of vitreous enamel department.

Applying lacquer to nameplates by brushing and spraying

Application of Lacquer Enamels

To insure good adhesion of lacquer colors, the nameplates m be chemically clean before application. The lacquers are purch already prepared from lacquer manufacturers.

Lacquers are applied with spraying equipment which consist a spray gun, a lacquer container and a booth in which the opera is carried out. Numerous types of spray guns are on the mar the progress in the development of superior types having b rapid during the past ten years. The primary requirements are l weight, simplicity, good atomization and a constant flow of lacq A pressure regulator is used for controlling the pressure that fo the lacquer color from the lacquer container through a hose to spray gun.

Lacquers for use in spray guns are usually made more fluid the addition of thinner. Lacquer that is too thick results in even, wavy drying and often in poor adhesion to the namepla Lacquers that are excessively thin do not cover well. Long exp ence and skill enables operators to judge precisely the correct flui of lacquers.

Stencils are usually used to confine the lacquers to the spec areas in the nameplates. The stencils must be washed freque with thinner to keep the nameplates clean and to avoid misses leaks.

The excess lacquer on the nameplates is removed by sev rubbing operations, with the use of thinner. This process ren raised lettering or designs free from lacquer.

The nameplates are inspected for possible rubouts, misses specks. When such defects occur, the lacquer is completely rem with thinner and the area resprayed.

The nameplates are then ready for baking. Facilities inc tunnel ovens lined with infra-red lamps which bake the lacquer temperatures ranging from 350° to 400° F.

Post-War Nameplates

Suspended production of many appliances during these years is creating a vast market for the days following victory. pliance manufacturers will again be spending millions of dollars advertising to make people "brand conscious." That is why ma facturing executives and design engineers will select their na plates with care in respect to design, colors, finish and wearing q ity. Without adequate display of the brand name or signature the appliance, advertising expenditures for publicizing the br cannot achieve full sales possibilities.

Carbon Dioxide Protection of Finishing Operations

By C. D. SCHMOLZE

C-O-Two Fire Equipment Company, Newark, N. J.

FIRES in solvents and other flammable liquids used in organic finishing operations are likely to be sudden in appearance, rapid in growth and devastating in effect, if not quickly controlled. An effective extinguishing agent for such fires therefore, must be one which goes to work on the fire in the shortest possible time.

Among the fastest acting extinguishants is carbon dioxide. Special equipment has been designed for making it quickly applicable in the protection of flammable liquid risks. Moreover, it has additional characteristics which make it especially suitable in connection with finishing processes.

A clean, dry, inert gas, carbon dioxide (or CO_2 as it is known chemically) "smothers" fire by rapidly cutting off the oxygen supply. It does this by "blanketing" the burning material or, as in the case of fixed systems protecting an entire room or area, by speedily diluting the oxygen content of the air to a point where it will not support combustion. Heavier than air, it has a tendency to remain where it can do the most good and, being a gas, it is capable of permeating inaccessible regions. As a non-conductor of electricity it is safely used on fire in live electrical equipment. With more than half the fires in flammable liquids ascribed to electrical causes, use of this gas for protection of finishing operations is doubly desirable.

Carbon dioxide is stored in steel cylinders, with capacities ranging from 2 to 100 pounds of the extinguishant in liquid form under pressure. Released from the cylinder, it is discharged as a gas, capable of expanding 450 times its volume by the force of its own pressure in the cylinder. The gas emerges from the cylinder as a vapor containing a little dry ice or "snow." It does not freeze and will not deteriorate in its containers.

Carbon dioxide protection of finishing operations is provided by portable hand or wheeled type extinguishers or by fixed built-in systems.

Portable Extinguishers

Portable extinguishers are properly regarded as first aid equipment for areas of unconcentrated hazard where the principal protection is provided by other means. In extra-hazardous locations such as are being considered here, one carbon dioxide extinguisher of 15 or 20 pounds capacity should be available for every 2,500 square feet of floor space throughout the processing area and should be so located that it is unnecessary to travel more than 50 feet to reach the nearest unit. Where extra-hazardous processes within these areas are not provided with fixed built-in protection, additional portable extinguishers should be provided.

In operating a carbon dioxide portable extinguisher, the discharge should always be directed at the base of the flames. With flammable liquid fires, the best results are obtained when the discharge is used to sweep the flame off the burning surface of the liquid, starting at a point nearest the operator and gradually progressing forward, moving the discharge horn slowly from side to side. The gas should be applied to the burned surface even after the flames have disappeared, so that sufficient gas and snow will remain to safeguard against possible reflash.

Built-in Systems

Fixed built-in carbon dioxide systems are designed for the protection of concentrated areas of special hazard where "total flooding" of the entire room or area is required. More localized protection of particular hazards is provided by built-in systems which are arranged for applying the gas directly at the point of greatest hazard. Such applications are most suitable for individual spray booths, dip tanks, agitators, etc.

Fixed systems consist of one or more 50- or 100-pound size cylinders manifolded and mounted inside or outside the protected room or area and connected to discharge nozzles in the protected space by a simple piping system. For "total flooding" installations, these nozzles are located around the walls of the room. In "local" application installations, the nozzles are placed directly over or close to the point of greatest hazard. Direction or selector valves in the piping system make it possible to protect more than one type of hazard with the same battery of cylinders.

Fixed systems are arranged for manual control and may also be equipped for automatic release by means of thermostats. Manual control may be local or remote. Where the cylinders are located inside the protected space, remote control is always recommended. Completely automatic systems use carbon dioxide pressure to close windows and doors, shut down machinery and sound an alarm by means of carbon dioxide trips and switches. One type of built-in system also uses the pressure of the carbon dioxide itself to actuate the cylinders. In these systems, "pilot" or control cylinders are released by manual or automatic means and the carbon dioxide pressure from these cylinders serves to discharge the rest of the cylinders in the group almost simultaneously.

Carbon dioxide protection of flammable liquids in storage, if in a separate room set aside for the purpose, is best accomplished by a fixed built-in system for total flooding of the entire room. Such protection will suffice also for whatever handling may be necessary in that quarter.

Mixing tanks in a separate room may be protected by a similar built-in system or may be provided with built-in local protection by having the discharge nozzles fixed directly over or close to each tank.

Spray Booth Protection

Adequate carbon dioxide protection of spray booths is achieved with built-in systems adapted to provide local protection to the particular style of spraying equipment. With individual spray booths, carbon dioxide discharge nozzles may be centered in the hoods or ceilings of each booth directly over the work area. These may be supplemented by several special type nozzles lining the entrance to the booth to provide for throwing a curtain of carbon dioxide across it to confine the fire to the enclosure. Usually these installations are arranged for automatic release by means of rate-of-rise or fixed temperature thermostats at the ceiling level. They can, of course, be manually operated also.

Other finishing methods, such as brushing, roller coating, tumbling or centrifuging lend themselves to the type of local protection provided by placing one or more discharge nozzles directly over the point of greatest hazard at each machine.

Dip Tank Protection

Dipping is one of the most hazardous finishing operations, because it is carried out with large open tanks of highly flammable liquids subject to flashing at ordinary temperatures. Moreover, the vapors thus given off are capable of forming explosive mixtures. Often the tanks used in dipping are used in connection with large ovens also subject to fire and explosion. The mixtures found in dip tanks may include various amounts of naphtha, benzine, benzol, amyl acetate, alcohols, etc., which represent the principal flammable liquids. Of a slightly less hazardous nature are tanks containing paints, turpentine, kerosene, and heated asphaltum.

The principal hazard incident to dipping operations lies in the fact that the vapors given off by most of the solvents are heavier than air and settle in low places, especially in the corners of rooms where air may not circulate. Light vapors accumulate at the ceilings. Somewhere between the two levels there may be the exact mixture to make possible an explosion. Tests have revealed that not infrequently richer mixtures are present in passages and corridors leading from dip rooms than in the dip rooms themselves. Any

source of flame, sparks or moderately se heat may cause fires in these locations.

Dip tank fires are long burning beca only the surface of the liquid is involv An ordinary mixture two feet deep may b fiercely for two or three hours. The smo and fire from tank fires is usually v heavy, making fire fighting difficult a dangerous. Some automatic means prompt extinguishment is therefore indic ed. A specially designed carbon diox built-in system for local application w discharge nozzles fixed directly over the tank meets all of the requirements. T discharge nozzles can be installed so as include the drain boards. Even the sto over the drain boards may be included the protected area, if not otherwise provi for.

Carbon dioxide automatic systems chain conveyor systems of dipping, empl ing a series of tanks and drying ovens, m be especially designed for each installati Inasmuch as the movement of the conve interferes with the use of covers, wh otherwise could be arranged to close au matically in case of fire, an automatic bui in system is essential. In these systems t carbon dioxide discharge nozzles may built into each dip tank in the conve with a thermostat directly overhead. Tan used in flow coat operations may also protected by carbon dioxide automatic s tems.

Carbon dioxide built-in systems are al recommended for the protection of ovens a exhaust ducts. In addition to providing tinguisher protection, the hazards of fire a explosion in these can be materially redu by the use of carbon dioxide gas to ma tain an inert atmosphere within them. T oxygen content of the air is normally per cent. The proportion that the oxy content inside the oven must be reduc varies with the different materials bei handled. Such installations are obviou an engineering operation and each case m be worked out individually.

Maintenance

Good practice calls for checking carb dioxide system installations and first s equipment at regular intervals, not exceedi one year, to insure proper functioning at times. The contents of cylinders should checked by weighing. Equipment is ava able for weighing and inspecting the cyl ders in fixed systems without removing th from the bank or interfering with the em gency operation of the systems during t process.

Cylinders of any size which show a weig loss of one-tenth of the contents stamped them should be refilled immediately. Th may be returned to the manufacturer or l authorized agents or refilled at nearby c bonic gas plants. Large users of carb dioxide are likely to have their own recha ing equipment. This may consist of a "t pass" recharging unit, which, however, suitable only for hand extinguishers, or "transfer" unit equipped with a motori pump, suitable for recharging all sizes cylinders. Supply cylinders of carbon dio ide are readily available almost anywhere the United State .

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Patents

Bronzing Lacquer

U. S. Pat. 2,349,571. C. F. Cummins, assignor to The Dow Chemical Co., May 23, 1944. A package-stable bronzing lacquer, comprising, as the film-forming solids, from 15 to 50 per cent by weight of ethyl cellulose having an ethoxy content greater than 47.5 per cent and correspondingly from 85 to 50 per cent of a coumarone-indene resin compatible with the ethyl cellulose, and up to 40 per cent of a plasticizer for the ethyl cellulose which is also compatible with the coumarone-indene resin, based on the combined weights of ethyl cellulose and coumarone-indene resin dissolved in a hydrocarbon solvent predominantly aromatic in character and having a Kauri-butanol value over 50, and a pigment comprising a leafing metal powder.

Treating Lacquers

U. S. Pat. 2,349,737. J. L. Krieger, May 23, 1944. A process for the restoration of the original clear color of lacquers that have been discolored through the use in dipping operations involving copper and copper containing materials by the addition thereto of 0.1 to 1.0% of maleic acid.

Coating Composition

U. S. Pat. 2,350,279. J. M. Hoeffelman (Netherlands), assignor to Shell Development Co., May 30, 1944. A ground-surface-covering comprising mineral aggregates which have been coated with a substantially asphalt-free mineral lubricating oil which has been reacted with between about 0.2% and 5% by weight of a sulfo compound having the formula RO — SO_2 — X in which R is a primary alkyl group having up to 8 carbon atoms and X is an organic radical of the class consisting of hydroxyl, primary alkoxy and aryl radicals, at a temperature between about 50° C. and 200°C., and for a time between about one hour and one minute, the time of contact being inversely proportional to the temperature of the treatment.

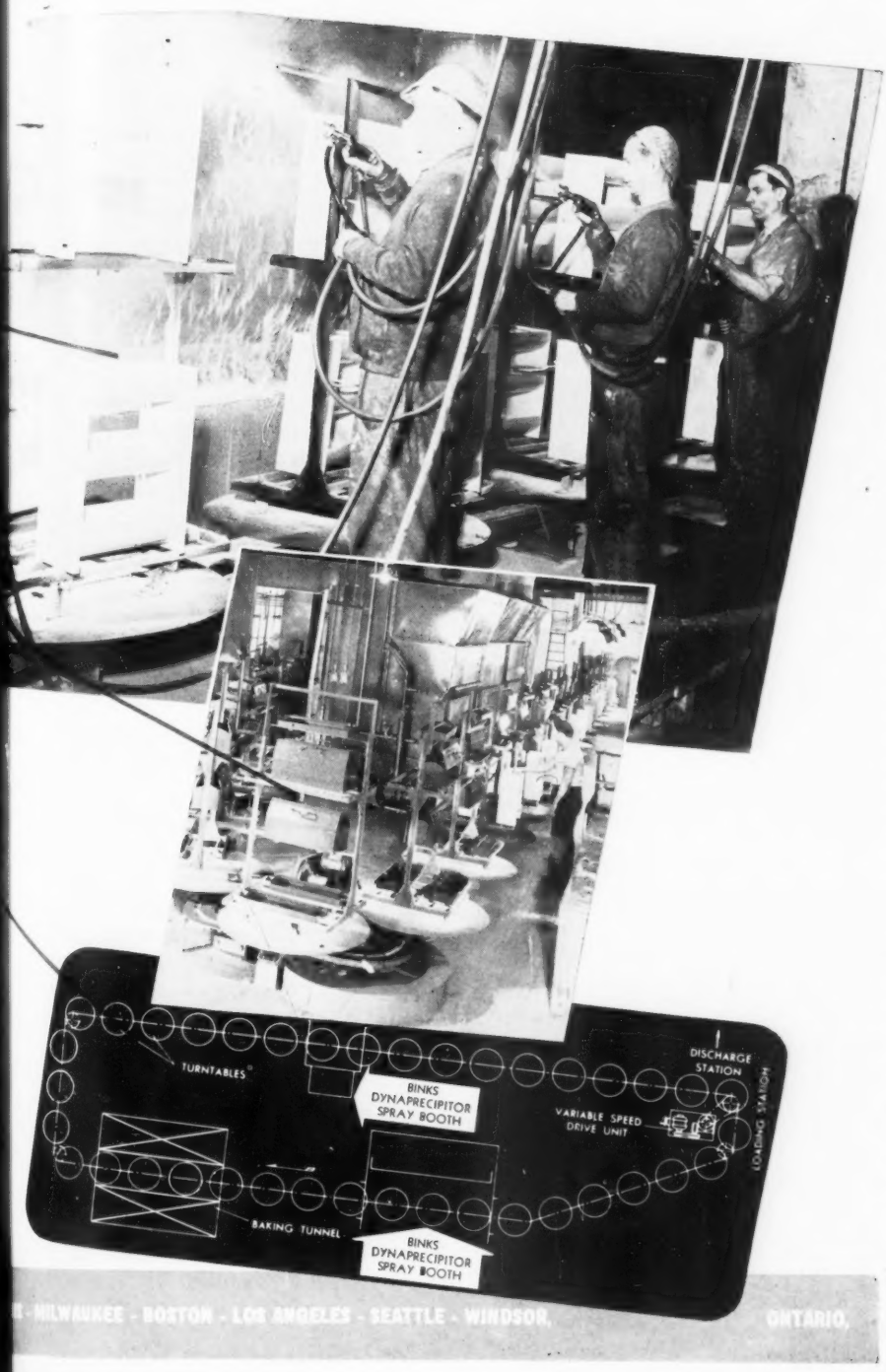
Wrinkle Finish

U. S. Pat. 2,350,818. G. E. Rees, assignor to Trojan Powder Co., June 6, 1944. The method of giving a crackle finish to an article and emphasizing the crackle effect obtained which comprises applying to the article a crackle lacquer including a volatile solvent medium and starch nitrate in proportion equal at least to 6 parts for 1 part of plasticizer present and adapted to crackle on evaporation of the solvent medium, causing the solvent medium to evaporate, applying over the resulting crackle finish a hardenable glazing material of color different from that of the crackle lacquer, wiping glazing material from high spots of the lacquer, and hardening remaining glazing material in the cracks of the crackled lacquer film.

The method of giving a crackle finish to an article which comprises applying to the article a crackle base coat, applying over the base coat a film of crackle lacquer including starch nitrate, a substantially non-volatile plasticizer for search nitrate and a volatile solvent medium for the starch nitrate and plasticizer, and causing the volatile solvent medium to evaporate from the applied crackle lacquer, the starch nittrate constituting at least 60% of the non-volatile material of the crackle lacquer and the said volatile solvent medium consisting principally of aliphatic acetate and liquid hydrocarbon, having an initial evaporation rate at least as rapid as that of the mixture of 20 parts of butyl acetate, 50 of ethyl acetate and 30 of toluene, and having film smoothing power substantially greater than that of ethyl acetate alone.

Varnish

U. S. Pat. 2,351,545. A. E. Rheineck and S. B. Crecelius, assignors to Devoe & Reynolds Co., Inc., June 13, 1944. In the process of making varnishes the steps which comprise heating together for at least about two hours soaps of drying oil fatty acids having non-conjugated double bonds and an oil soluble varnish resin in proportions to give a varnish length of between 5 and 30 gallons and at a temperature of between 200° C. and 285° C., and subsequently forming a polyhydric alcohol ester of the fatty acids represented in the soap, in the presence of such resin.



Coating Compound

U. S. Pat. 2,353,198. F. J. Soday, assignor to The United Gas Improvement Co. July 11, 1944. A method for producing a coated can cover having sharply bent portions from metallic sheeting which comprises coating said sheet from which the can cover is to be formed with resinous copolymer of between 50% and 99% by weight on the undiluted basis of at least one cyclic conjugated diene selected from the group consisting of cyclopentadiene and alkyl cyclopentadiene with between 50% and 1% by weight on the undiluted basis of at least one aliphatic conjugated diolefine having less than 6 and more than 3 carbon atoms per molecule, drying said coating, cutting a blank of the desired shape from said sheeting, and die-drawing said coated blank to the desired can cover shape having said sharply bent portions.

Coating Composition

U. S. Pat. 2,351,716. R. L. Smith, assignor to The Carborundum Co., June 20, 1944. As a liquid coating composition, a smooth creamy liquid suspension of finely divided solid particles of a normally solid fusible resin in a mixture of water and liquid reactive resin miscible therewith, the said mixture being a poor solvent for the said solid resin at ordinary temperatures and the said liquid resin being a relatively good solvent for the said solid resin at said temperatures.

Decoration of Surfaces

U. S. Pat. 2,351,717. LeRoy D. Soff, June 20, 1944. The method of ornamenting or decorating a surface, which includes applying to the surface a liquid including a binder and suspended matter comprising particles each having one dimension many times that of another, and draining excess liquid from the treated portion of the surface to leave irregular areas substantially free of said particles.

Striping Tool

U. S. Pat. 2,351,847. A. J. Tegethoff, assignor to Packard Motor Car Co., June 20, 1944. A striping instrument comprising a body having a recess at one side, a series of plates secured in the body recess, pump means housed by said plates, a source of striping fluid communicating with said pump means, a staff fixed to the forward end of one of said plates, a nozzle pivotally mounted on said staff, a fluid connection between the pump means and the nozzle passing through the staff and the plate to which it is fixed, spring means exerting downward pressure against the nozzle, and means limiting downward movement of the nozzle.

Organic Coating

U. S. Pat. 2,352,172. L. Auer, assignor to Ridbo Laboratories, Inc., June 27, 1944. In a paint, a vehicle containing substantially non-volatile rosin ingredients as at least the major drying and film-forming constituents, said ingredients comprising treated rosin material prepared by heating rosin to a decarboxylation temperature in the presence of a decarboxylation promoting agent to partially decarboxylate said rosin, and said ingredients further being characterized by the presence of both rosin acids and rosin hydrocarbons, and the rosin ingredients having an acid value of from 20 to 120, and said vehicle being characterized by a high degree of wetting power, good top- and through-drying characteristics, and substantial freedom from reliquefying of the drying and film-forming ingredients after formation of the paint film.

Lacquer for Zinc

U. S. Pat. 2,352,579. J. J. Waters, assignor to Etched Products Corp., June 27, 1944. A method for treating a pyroxylin lacquer to render the same adhesive to zinc surfaces, which comprises adding zinc dust to the lacquer and, after permitting the zinc dust to settle, decanting therefrom the thus treated pyroxylin lacquer.

Bronze Paste

U. S. Pat. 2,353,058. L. J. Mitchell, July 4, 1944. A bronze paste consisting of straight run bronze powder, resin of acid number lower than 8 and a volatile thinner free of sulphur and acidity.

Carbon Tetrachloride (Tetrachlomethane)

Problem

What are the hazards and what precautions are necessary in the use of carbon tetrachloride?

Hazards

The principal hazard is that of poisoning by inhalation of the vapors or by contact of the liquid with the skin.

Discussion

Carbon tetrachloride is a heavy, colorless, volatile, non-flammable liquid with an odor which resembles that of chloroform. It is obtained by reaction of chlorine on carbon disulphide or by the action of sulphur chloride on carbon disulphide in the presence of powdered iron. It mixes well with organic solvents but only slightly with water or glycerine. It is extensively used in certain fire extinguishers and as a solvent in the chemical, rubber and dry cleaning industries. It is also used in medicine as a drug to kill certain intestinal parasites. It is shipped in tin cans and galvanized or black iron drums.

In some processes, carbon tetrachloride may become contaminated with dangerous impurities such as phosgene, hydrogen sulphide, free hydrochloric acid, organic sulphide and carbon disulphide, many of which may be removed by redistillation. When carbon tetrachloride is mixed with other materials to lower their flammability, mixtures are sometimes formed which are more toxic than the carbon tetrachloride. A concentration of 100 parts per million in the air is considered the safe maximum for continuous exposure. Intermittent exposures higher than 100 parts per million are safe for short periods. For example, a concentration of 400 parts per million is safe for 30 minutes, and one of 1000 parts per million for not more than 10 minutes. The health hazard of carbon tetrachloride is considered slight provided proper equipment and ventilation are employed in its use.

Symptoms of Poisoning

The symptoms of chronic poisoning by inhalation of carbon tetrachloride vapors are nervousness, loss of appetite, headache, nausea, jaundice, liver trouble and inflammation of the kidneys. The primary symptoms of acute poisoning are headache, nausea, and lachrymation. These may be followed by loss of consciousness, coma and death but these latter effects are seldom encountered in industrial activity.

Carbon tetrachloride in contact with the skin dissolves the skin fat and thus causes it to become so dry and irritated that it will chap and mild dermatitis may follow.

First Aid

If a person displays symptoms of poisoning because of the inhalation of carbon tetrachloride vapors, he should be removed to fresh, uncontaminated air. If the symptoms are at all severe, a physician should be summoned.

If carbon tetrachloride has been spilled on the skin, cocoa butter, vaseline or a good grade of cold cream should be used to restore the oil to the skin.

Precautions

Processes using carbon tetrachloride should, if possible, be carried on in closed containers or under hoods equipped with down draft exhaust system which will remove the vapors at their point of origin in such manner that the vapors will not be drawn past the face of the worker. Carbon tetrachloride vapors are heavier than air.

If the use of closed containers or an efficient exhaust system is not possible, the worker should wear a gas mask equipped with a canister which will afford the necessary respiratory protection.

Carbon tetrachloride should not be used in confined spaces such as small rooms, vaults or pits where the ventilation is poor or the air is in any way contaminated. If a worker must use carbon tetrachloride in such a place he should not only wear a suitable gas mask as suggested but he should also wear a suitable life belt to which is fastened a life-line. This line should extend to the outside where it should be attended by a fellow employee who can pull the worker into fresh air in an emergency.

Only selected workers should be assigned to operations involving the use of carbon tetrachloride. The following persons should not be assigned to those operations:

a. Alcoholics.
b. Exceedingly fleshy individuals.
c. Undernourished persons.
d. Those with pulmonary diseases, gastric ulcers, high blood pressure, liver, kidney or heart trouble.

If carbon tetrachloride is mixed with flammable liquids such as naphtha, acetone, alcohol and amyl acetate to reduce their flammability, care should be taken to make sure that the liquids are thoroughly mixed. Such mixing should preferably be done by means of a mechanical agitator. The mixtures should be tested at frequent intervals with a hydrometer to make sure that evaporation has not appreciably changed the proportions.

When carbon tetrachloride is used in fire extinguishers, only those fluids recommended by the fire extinguisher manufacturers should be employed.

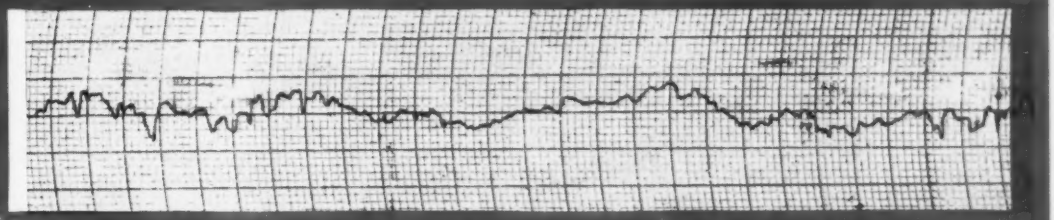
Carbon tetrachloride workers should be physically examined at regular intervals.

All processes involving the use of carbon tetrachloride should be inspected at frequent intervals to make sure carbon tetrachloride vapors are not present in sufficient concentration to affect the workers.

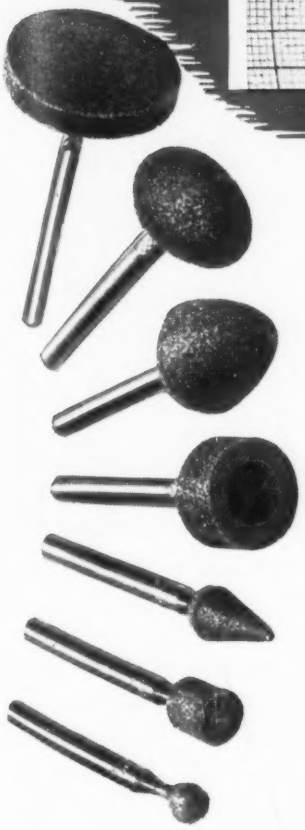
In some plants, workers who may be splashed or spattered with liquid carbon tetrachloride use a protective skin lotion containing gelatin, agar-agar, iceland moss, gum tragacanth, water and a small percentage of glycerin.

(Reprinted by permission of National Safety Council, Chicago, Ill.)

Proof of a Better Finish



Each small square represents 1.0 micro inches. Micro inch r.m.s. = 0.9 — 1.6.



Surface Analyzer Tape Proves You Get A Better Finish With Chicago Wheels

These results were obtained at a rate of 10 pieces per hour in an aircraft parts plant. Material, X-13-15, Rockwell 60 to 57, grinds out .006 to .007 stock. Chicago Wheel used, ½ x ½ x ⅛", Grain 180, Grade L Arcite FV Bond. Spindle Speed 40,000 r.p.m. Lapping and super finishing eliminated on this job.

Can you match that finish? Sounds phenomenal, but you can do it with Chicago Wheels. And, the secret of their superiority lies in the new FV Bond, developed exclusively for Chicago Wheels, after 50 years' experience making wheels for the most accurate and precise applications.

HERE'S WHAT FV BOND WILL DO FOR YOU

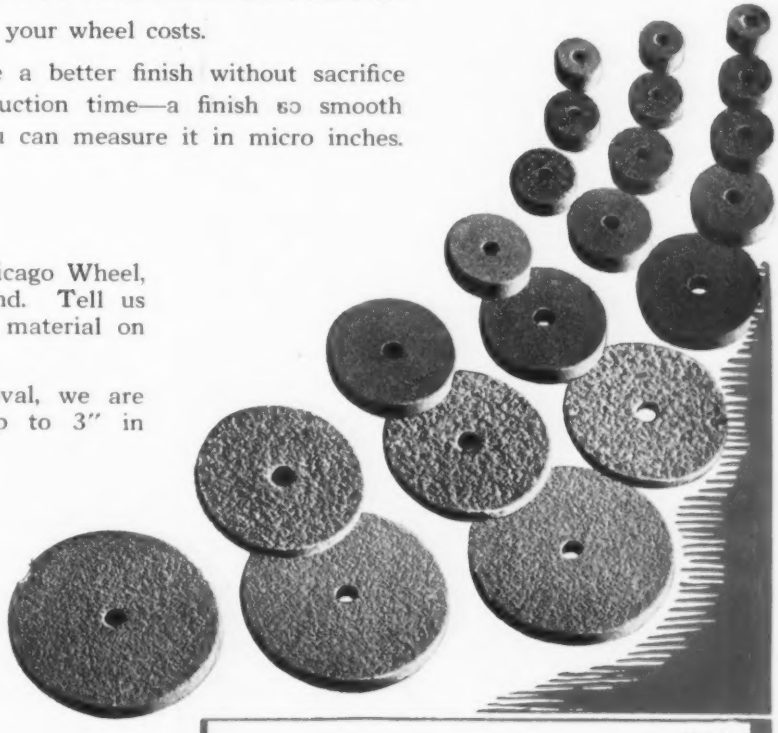
- Reduce your wheel costs.
- Produce a better finish without sacrifice of production time—a finish so smooth that you can measure it in micro inches.

TRIAL WHEEL FREE

Write or send the coupon today for a Chicago Wheel, made with this remarkable new FV Bond. Tell us grinder you use, size wheel and kind of material on which you will make your test.

For the duration, with full WPB approval, we are specializing on small sizes—anything up to 3" in diameter.

Write for Catalog and one of the new Engineering Survey Forms, a step in the direction of better finishing.



Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Industry.

MOUNTED WHEELS SMALL GRINDING WHEELS

CHICAGO WHEEL & MFG. CO.

America's Headquarters for Mounted Wheels and Small Grinding Wheels

1101 W. Monroe St., Dept. ML, Chicago 7, Ill.

ML-9

Send Catalog and Survey Form. Interested in
( ) Mounted Wheels. ( ) Grinding Wheels.
( ) Send Test Wheel. Size .....

Name .....

Address .....

Keeping The Army's Pipeline Together

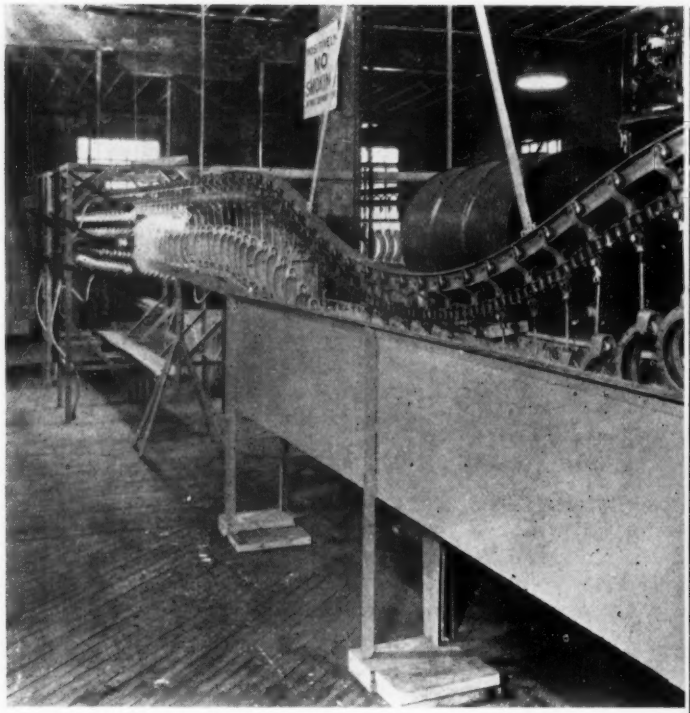


FIG. 1—Dipping pipeline clamps

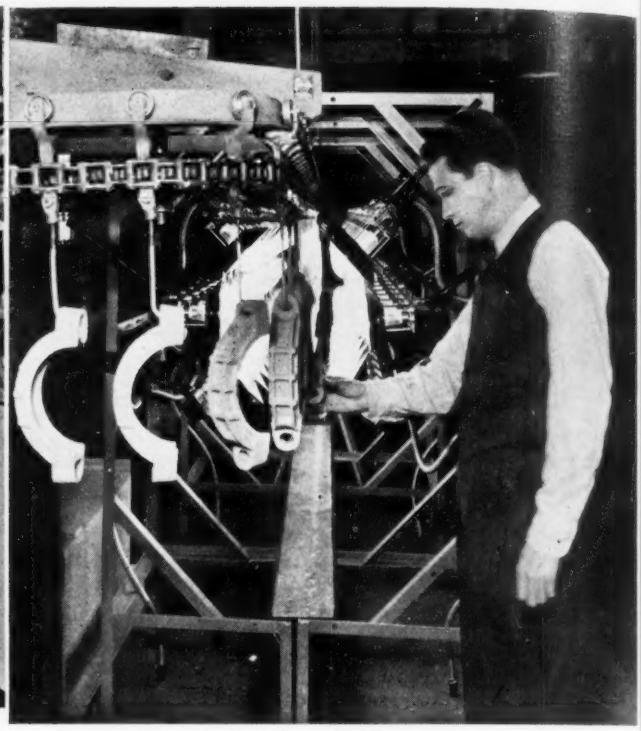


FIG. 2—Inspection station. Infra-red baking oven in background.

THE petroleum industry has pushed its amazing pipelines further and further into the battle zones of World War II until today they snake their way right up to the front lines. "Portable" gasoline and oil pipe lines, so called because they are quickly assembled to follow along with armies on the offense, are now in action in Italy and on Southern Pacific islands. Twenty-foot sections of light flexible, 4-inch pipe are laid from tankers across beaches, over deserts and rivers and through jungles up to advance air fields. Wrapped around trees, bent over hills and curved across streams, the pipe line is held securely by strong couplings which must not fail through corrosion. Before these vital fittings leave the factory, they are given a hard, weather resistant coating of dull olive drab enamel.

The increased tempo of our war operations has increased the demand for these fittings tremendously, so high speed finishing is essential. Figure 1 shows long rows of couplings suspended from automatic conveyor as they dip down into a tank of enamel. Figure 2 shows inspection of couplings for the "portable" pipeline as they leave the high speed infra-red drying tunnel. The protective film of enamel must withstand extremes of hot and cold without breaking down, otherwise corrosion would make quick assembly and disassembly of the pipeline impractical.

Illustrations courtesy of Sherwin-Williams Co.

RUST!!

Prevention or Removal

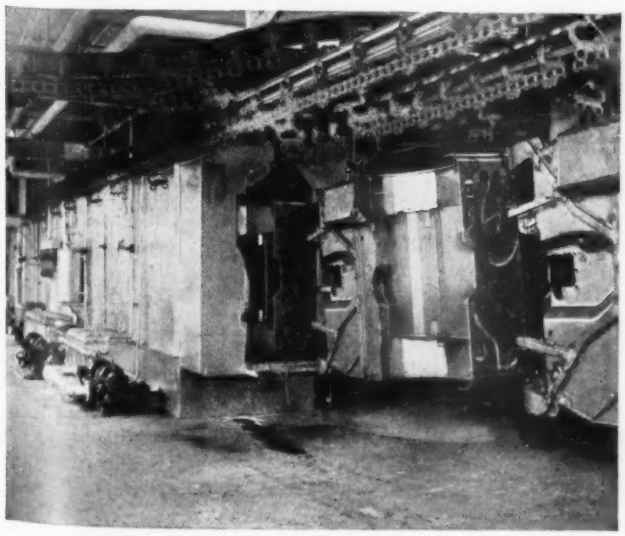
In the Humid Months of Summer and Early Fall—the Rusty Season—the Rust Problem Becomes Acute

Rust, especially during rainy, humid weather, often becomes so troublesome as to seriously interfere with the steady flow of production. Rust can disrupt the whole production line and cause serious bottlenecks unless steps are taken to prevent or remove it during fabrication. With ACP Deoxidines rust removal becomes a simple matter of routine.

RUST REMOVAL

There are types of Deoxidine adapted for use in large, continuous, mechanized production in power spray washers that remove both rust and oil. Other types are adapted to immersion processes that may be mechanized or manually operated to suit production needs. There are still other types for hand wiping processes to remove occasional light rust that otherwise would require slower and more laborious mechanical operations.

These and other Deoxidines not only clean the metal—removing rust and destroying or inhibiting rust producers—they also properly condition it for painting.

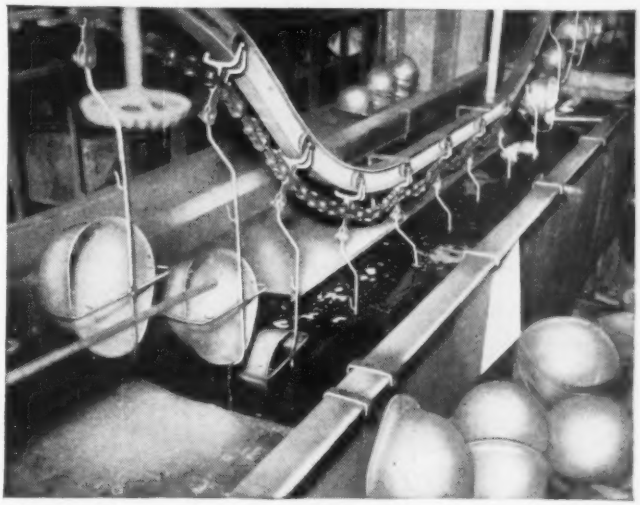


A—Spray types of Deoxidine are adapted to the cleaning and processing of large surfaces in quantity production.

RUST PREVENTION

Peroline, a combined chemical and oil, not only provides a thin oil coating, effective in retarding rust, but it is unique in that it removes blushes of rust and marks from sweaty hands and destroys visible or invisible chemicals that would develop rust under conventional preventive coatings. While the amount of rust removal with Peroline is limited, its ability to remove thin coatings will often eliminate a separate cleaning or salvaging operation.

Today, Deoxidine, Peroline and other ACP Chemicals are aiding in the production of many war



B—An immersion type of Deoxidine is well suited to the rapid cleaning of helmets with mechanized equipment.

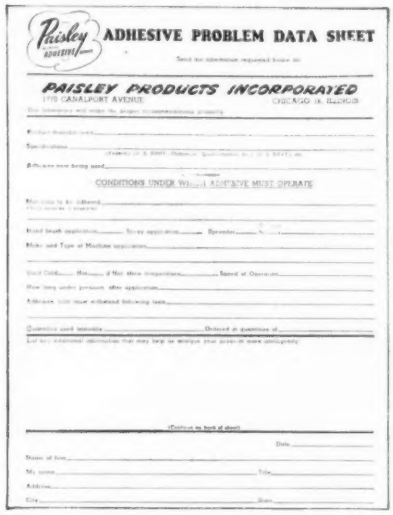
essentials. They are aiding in salvaging various items which, due to improper cleaning or lack of proper protection, have become rusted during fabrication and storage. They are helping to insure satisfactory finishes and are minimizing rejections in the production of many vital war supplies including Shells, Rockets, Ammunition Containers, Automotive Equipment (jeeps, tanks, trucks, etc.), Marine Equipment, Aircraft and Aircraft Parts, Signal Corps Equipment and hundreds of miscellaneous components.

Further information on rust removal or prevention and Service Data Sheets on Deoxidine and Peroline may be obtained by addressing the American Chemical Paint Company, Ambler C-9, Penna.

NEW EQUIPMENT AND SUPPLIES

Adhesives Data Sheet

Step by step recording of necessary information required for proper analysis of adhesive problems is made easy with a new questionnaire adopted by Paisley Products, Inc., Chicago and New York City. Many industrial plants and war contractors requiring adhesives for new operations or in packaging war materials for export may not be aware of all the facts and information the adhesive chemist requires for proper study and reference. Accurate diagnosis can only be certain when all the facts pertaining to the problem are carefully considered.


ADHESIVE PROBLEM DATA SHEET

PAISLEY PRODUCTS INCORPORATED

CONDITIONS UNDER WHICH ADHESIVE MUST OPERATE

Over 400 chemicals and raw materials are used in compounding modern industrial adhesives, and the working qualities can be adjusted to provide extremely accurate operation in industrial application. Consequently, correct data can narrow the selection of an adhesive to a fine point resulting in higher standards of performance, lower costs and the saving of precious time.

According to the Paisley Laboratory announcement, their "Adhesive Problem Data Sheet" for recording and transmitting problem information has already aided industrial concerns in the quick solution of fabricating and packaging adhesive problems.

Anyone desiring a copy may write direct to Paisley Products, Inc., Dept. OF, 1770 Canalport Ave., Chicago 16, Illinois.

Decal Transfer

The cry of "Fire" can be doubly terrifying to the employee who can't see or remem-

"I'm all dressed up in my new coat of JOHNSON'S CORROSION-INHIBITING WAX!"

• Many metal tools, before starting out on essential war work, wear a protective shop coat of Johnson's Corrosion-Inhibiting Wax.

Made by the makers of Johnson's Wax, these coatings, in addition to inhibiting rust and corrosion, help make surfaces more dirt, water and weather resistant. They possess marked advantages because they are dry and do not "soak away" in absorbent materials as do oils and greases.

Johnson's Corrosion-Inhibiting Waxes are for use on untreated, black oxidized and phosphated metal surfaces. They are non-flammable and non-toxic. They come ready to use—no mixing or dilution is necessary.

Today Johnson's Corrosion-Inhibiting Waxes protect vital war materials . . . tomorrow they will safeguard peacetime metal products. If you manufacture metal merchandise you have a use for them—write for complete information!

When peace comes, special corrosion-inhibiting wax finishes will be available to protect and give "eye appeal" to metal parts of automobiles and airplanes, metal kitchen equipment, hand tools . . . metal furniture, nuts, bolts, tin cans . . . typewriter and camera parts . . . the list is endless!

War Materials like these are protected by Johnson's Rust-Inhibiting Waxes

• Gun clips, rifle pins, gun parts • Parts for planes, tanks, jeeps • Machine gun parts • Shovels, picks, axes • Tools and wrenches of all types • Micrometer heads and machine dials • Radio frequency coils • Overseas water heaters • Snaps and buckles for parachutes • Nuts, bolts, washers, rivets • Gun barrels • Harness snaps and rings • Bayonets, machetes, rifle grenades • Aeronautical instruments • Smoke canisters for chemical warfare

S.C.JOHNSON & SON, Inc.

Industrial Wax Division, Dept. MF-94, Racine, Wis.
Canadian address: Brantford, Ontario
Makers of Johnson's Waxes for Industry

★ *Buy more War Bonds!* ★

ber the exact location of the nearest fire extinguisher.

Many shops and factories, conscientious in providing modern extinguishing equipment, and training personnel in the latest fire-fighting methods, fail to properly mark the location of each extinguisher within the property area.

Painting and lettering of fire extinguisher signs on pillars, walls, or compartments, takes precious time and labor from already over-burdened manufacturers. Realizing this, Randolph Laboratories, Inc. has developed a new extinguisher locater sign; a decal water-transfer that can be instantly placed above all extinguishers in the plant area.

This neatly designed, 10-inch diameter locater, printed in large white letters on a bright red background, is visible for 75 feet in any part of the plant. Transfers should be placed high enough so as not to be obstructed from view by machinery or equipment. Directions for application are printed on the reverse side of the transfer.

Locaters for all extinguishers in your plant may be obtained from the manufacturer at a minimum charge. Write Randolph Laboratories, Inc., Dept. OF, 8 East Kinzie Street, Chicago, 11, Ill.

Aeroil Plast-O-Dip Tank

A new, electrically heated Plast-O-Dip tank for the heating, melting and dipping of ethyl cellulose compounds has been designed by the Aeroil Burner Company, Inc., Dept. OF, West New York, N. J.

This unit features indirect heating through the medium of an agitated hot oil bath that completely surrounds the material. As a result, the manufacturer claims that completely uniform, indirect heat is distributed underneath, above, around and within the ethyl cellulose without any possibility of localized over-heating, "hot spots" or degradation of the melt.

Both tank and removable cover are completely insulated. Tests have shown an overnight heat loss in the compound of only 10° F. per hour with all heat shut off. Two thermostats automatically hold the oil bath at any desired temperature required by the particular ethyl cellulose formulation being used. A built-in dial thermometer permits checking of the oil bath temperature. Available either for 110 or 220 volt AC current, it uses two 4.5 KW heating elements, with liquid-proof covers and heating coils sealed within steel blades.

The Plast-O-Dip tank — with a dipping space 25″ long, 13″ wide and 12″ deep — can be used for melting, heating and dipping. No "Mother Tank" is necessary. A heated, removable, adjustable, dividing partition permits the addition of cold compound during the dipping operations without adverse effect on the temperature of the molten plastic. Complete descriptions, specifications, X-ray diagram and action photographs are contained in illustrated bulletin No. 280 available on request from the manufacturer.

New Thiokil-Cork Skid-Proof Coating

A new non-skid airplane walkway coating that is less than one-fifth the weight of rubber matting, adheres to metal, plywood and painted surfaces, remains flexible at temperatures ranging from minus 20° F. to plus 160° F. and is resistant to fire, gasoline, aromatic fuel, salt water, oils and hydraulic fluid and oxidation has been developed by the Minnesota Mining and Manufacturing Company, Dept. OF, St. Paul, Minn., for use in Allied war planes. Made of Thiokol synthetic rubber and ground cork, this new non-skid surfacing material is applied at room temperature with an open nozzle spray gun, making for speedy application as well as rapid field repairs. It can also be applied with a knife or brush and patches so constructed blend well with the original coating.

In exhaustive laboratory tests as well as field trials this new composition has stood up extremely well. Abrasion resistance has been tested both by Calibrase wheel and by a special floor panel which showed virtually no sign of wear after passage of 100,000 people over it. The tendency of the coating to gain weight through moisture absorption is also slight.

One of the important properties of the new coating material is its high coefficient of both static and sliding friction even when covered with water or a film of S. A. E. 1120 engine oil.

Only one spray application is necessary to build up sufficient thickness. The material dries rapidly and panels are ready for use within twelve to fourteen hours.

With its light weight, speed of application and resistance that is consistently superior to natural rubber, this material promises to be not only a valuable war material for airplane use but also to have many useful post war applications in the aviation, automotive and home fields.

Water Separator

A new aid for the use of air guns, sprays and brushes in applying industrial finishes, involving a revolutionary principle for automatically and continuously removing condensate (droplets, slugs, or mist) from compressed air and gas lines, has been announced by Selas Corporation of America, Dept. OF, Erie Ave. and D St., Philadelphia, and is embodied in a new family of "Liquijectors", designed and engineered for both function and appearance, and adaptable to air and gas lines up to 1¼" pipe size and

normal line pressures. No moving parts are involved and no cocks, traps or shutoffs are required in the drain line which is open to the atmosphere. Action is entirely automatic and continuous through two porous ceramic tubes — one inherently water-repellent, the other water-permeable but air-impervious.

Basis of the product is a new and recently discovered method for automatically separating liquid and gas phases by virtue of the surface tension of the liquid. Compressed air entering the Liqui-jector passes through the first (and water-repellent) tube where it is stripped of moisture. The action is by coalescence of droplets on the surface of this tube — a coarse ceramic material with an average of 50,000 pore openings per square inch, each so small that the pressure drop across the tube is insufficient to permit water passage against the resisting diaphragm-action of its surface tension. The coalesced moisture drops to the bottom of the unit where it passes through the second tube (without loss of air) to outside atmosphere. This second tube is constructed of micro-porous porcelain, with an average of 720 million pore openings per square inch, and (being constantly wet by its wick action) constitutes a perfect air seal up to the rated limit working pressure of the unit.

Manufacturers' Literature

Standard Varnish Technical Bulletins

Standard Varnish Works, Dept. OF, Staten Island, N. Y. and Chicago, Ill., have issued the first of a series of technical bulletins for finishing technicians, designers, engineers and others interested in specific purpose industrial product finishes.

The first of these bulletins is devoted to their "Rockloid Baking Enamel", a non-alkyd synthetic with many desirable qualities.

A convenient folder for filing the bulletins is sent with this first bulletin. Requests for the bulletin will be promptly filled if made on business letterhead and addressed to Mr. M. L. Corbin, Sales Manager, Industrial Division, Standard Varnish Works, 2600 Richmond Terrace, Staten Island, New York.

Infrared Booklet

The Fostoria Steel Corporation, Dept. OF, Fostoria, Ohio, has recently issued a 12-page booklet titled *The Rewards of Industrial Efficiency*. Step-by-step illustrated stories of infrared and how it can be made to work efficiently on industrial baking, drying and heating problems are presented. Actual illustrations which have proven to save time, manpower, energy and floor space are given and a section is devoted to a description of the facilities and locations of service centers of the company. Copies of this booklet and also booklet No. NF-3, *The Near Infrared Process*, may be obtained from the company by mentioning *ORGANIC FINISHING*.

Dutch Boy Quarterly

National Lead Company, Dept. OF, 111 Broadway, New York 6, N. Y., has recently issued its Vol. 22, No. 2, issue of *The Dutch Boy Quarterly*. As usual, the quarterly contains practical and technical discussions of paint materials including an interesting presentation on linseed replacement oil in white paint. A feature of this particular discussion is a useful table of formulae for reducing paste white lead to paint for various types of interior and exterior application.

Profilometer Comments

"Profilometer Comments" is the name of a newsletter publication issued by *Physicists Research Co.*, makers of the Profilometer. Appearing bi-monthly, the first issue of the new volume came from the press this month.

Contents of "Profilometer Comments" include articles on operation of the Profilometer accessories and company services; and "kinks" and ideas on the use of the Profilometer.

"Profilometer Comments" is issued in standard 8½"x11" page size, four pages, and is extensively illustrated. Each issue is punched for insertion in a binder; an attractive binder is furnished those who wish to maintain a complete file.

Profilometer users and others interested in receiving copies of the "Comments" regularly should write Physicists Research Co., Dept. OF, Ann Arbor, Mich.

FUTURE MAGIC

Out of this war have come many "secret weapons" . . . weapons so effective that previous conflicts pale by comparison. Peace, too, holds its potent promise of "secret weapons" . . . a promise which is already being fulfilled.. New products, new applications, new techniques . . . in product finishing alone have come developments so startling, so revolutionary, that no product can conceivably remain unaffected. Chemistry must be the working partner of conversion . . . must certainly be included in your post-war planning. Our staff of expert finishing engineers will be glad to cooperate with your organization. Your inquiry incurs no obligation. Address The Stanley Chemical Company . . . manufacturers of Stanley Lacquers, Synthetics, Enamels and Japans . . . East Berlin, Connecticut.

Stanley Chemical

Business Items

Fred A. Brown

Fred A. Brown, formerly general manager of the Grand Rapids Varnish Corporation, Grand Rapids, Michigan, has been appointed vice-president and director of the Wood Finishes Division of the *Jones-Dabney Company*, Louisville, Ky., manufacturers of lacquers, varnishes, enamels and synthetic resins, it has been announced by *William C. Dabney*, president of the Jones-Dabney Company.

Mr. Brown is one of the leaders in the development and sales of wood and home furnishing product finishes. He was instrumental in leading the furniture industry to an appreciation and acceptance of improved finishing materials and methods which greatly improved the quality and sales appeal of fine wood products, including radios, pianos and household furniture.

The Jones-Dabney Company, a division of the Devoe and Raynolds Company, Inc. are currently 90 per cent occupied in the output of required war production finishes direct for the armed forces for sub-contractees. Mr. William C. Dabney, founder and president of the Jones-Dabney Company, is also executive vice-president of the Devoe & Raynolds Company.

The Sherwin-Williams Company, Cleveland, Ohio, has announced the appointment of *W. B. Bell* as manager of its southeastern sales district. Mr. Bell will make his headquarters at Atlanta, Georgia.

Since joining the company in 1922, Mr. Bell has occupied numerous sales positions, becoming Cincinnati division sales manager in 1933. In 1935 the Atlanta-Nashville divisions were combined under the managership of Mr. Bell. Later he became industrial sales manager for the then South Central division. Mr. Bell's experience has been widely dispersed in the trade sales, industrial, automotive and graphic arts fields.

It has been announced that *Carl Christiansen* has been appointed to the Engineering Staff of the John C. Dolph Company, Newark, N. J. He was formerly in charge of electrical construction for the Pan American Airways in the South Pacific. Previous to this he was associated with Curtiss-Wright Corporation — Electrical Division, and International Motor Company.

Gordon H. Robertson, general manager of the industrial division, *The Sherwin-Williams Company*, has announced the appointment of *M. A. Kindig* as assistant general manager. Mr. Kindig has had a varied industrial experience in the company's Cleveland, Chicago andWashington divisions. Duties in his new position will revolve around the company's efforts to better acquaint industry with its industrial finishing services. He will also play an important role in forthcoming plans to re-convert the company's activities to peacetime products. Mr. Kindig will make his headquarters at Cleveland, Ohio.

Acquisition of a substantial interest in *The Murphy Paint Company, Ltd.*, of Canada, has been announced by *H. B. Higgins*, president of the *Pittsburgh Plate Glass Company*.

Casper Apeland, General Manager of the *Zapon Division of Atlas Powder Co.* announces that *Gordon D. Burke* has been appointed sales manager for the Western Sales Division.

Born in Ottawa, Canada, in 1905, Mr. Burke was educated at the Ottawa University. In 1929 he became associated with Brevolite Lacquer Co. later acquired by Atlas Powder Company. From 1932 to 1938 he was a salesman in the North Chicago area and from 1938 to 1941 he acted as technical advisor to the sales department in connection with industrial finishes. In October, 1941 he was transferred to Wilmington as manager of priorities for the purchasing department where he remained until his present appointment.

ODDS and ENDS

Where It Goes Nobody Knows:

Quoting from a discussion which appeared in a recent issue of one of our esteemed contemporaries: "*A slightly positive pressure is maintained . . ., the total exhaust being 54,760 c.f.m., while the fresh air supply is 56,000 c.f.m.*"

Algebraic equations to us are like birds—when they're over our heads we don't like it. But, this was right down our alley. We subtracted 54,760 from 56,000 and got an excess of air supplied equal to 1,240 cubic feet each minute. Unless we are greatly mistaken, it wouldn't be long before the pressure became a lot more than *slightly* positive. It might be, of course, that the building was made of one of those marvelous new plastics and the walls and roof bulged to accommodate the increased volume of air and maintain that slightly positive pressure. But that's silly. Another possibility is that the first law of thermodynamics is no longer valid. Now if they only would have left the word *total* out of *total exhaust* we could have assumed that the excess air was leaking out through the cracks in the doors and windows and could then have gone back to contemplation of the Varga calendars which *Herman Neuhaus* (Aurilyte Process Co.) sends us each month.

Sports Dept.:

Navy doctors have announced a new method for treating athlete's foot, which should be of interest to electroplaters. The foot is placed in an ordinary acid copper plating solution and made the cathode by attaching a copper band soaked in salt water to the ankle, the band being connected to the negative terminal of a 6 volt current source. Six-minute treatments repeated for six or seven days are said to be very successful. Before platers begin to offer these treatments as a service to their customers, however, we would caution them about the laws against practicing medicine without a license.

The Printed Page:

An ad describes the salt spray testing apparatus in the advertiser's laboratory as follows: "*All the fury of a storm at sea rages within these cabinet walls when the lid is lowered and the salt spray turned on.*"

Batten down the hatches, mates, while the lab crew run for their sou'westers!!

On the shop hints page of a well-known magazine we came across a formula for an electrolytic cleaner, calling for both caustic soda and sodium bicarbonate, which reminds us of the time, many years ago, when a manufacturer of cleaning compounds confidentially informed us that he was adding bicarbonate to one of his caustic cleaners to keep the pH down. We will never forget the look of consternation on his face when he was shown the following equation:

$$NaOH + NaHCO_3 = H_2O + Na_2CO_3$$

For every pound of sodium bicarbonate he was adding, combining with about ½ lb. of caustic soda—total cost 3½ cents, he could just as well have used 1¼ lbs. of soda ash instead, this being formed anyhow—cost 1½ cents.

Looking over some recent patents we came across one issued to *Oscar von Kohorn zu Kornegg*. At last, we have found a name more unusual than *Minton H. Twinch*, who, we believe, sold a super-duper chromium plating solution in the East during 1936 or thereabout.

The Electrochemical Society wants to know who is responsible for the burette that invariably registers 99.44% purity. We think it's the same guy who reports the boric acid analysis in his nickel plating solution to the third decimal.

Slogan of the Month:

We haven't any War Bond slogan this month—but "DON'T LET THAT STOP YOU!